A Professional Press Publication

HP Professional

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AUGUST 1988

- What Is RISC?
- Winning The Workstation War
- MPE/XL: Fulfilling The Promise

BOOK REVIEW

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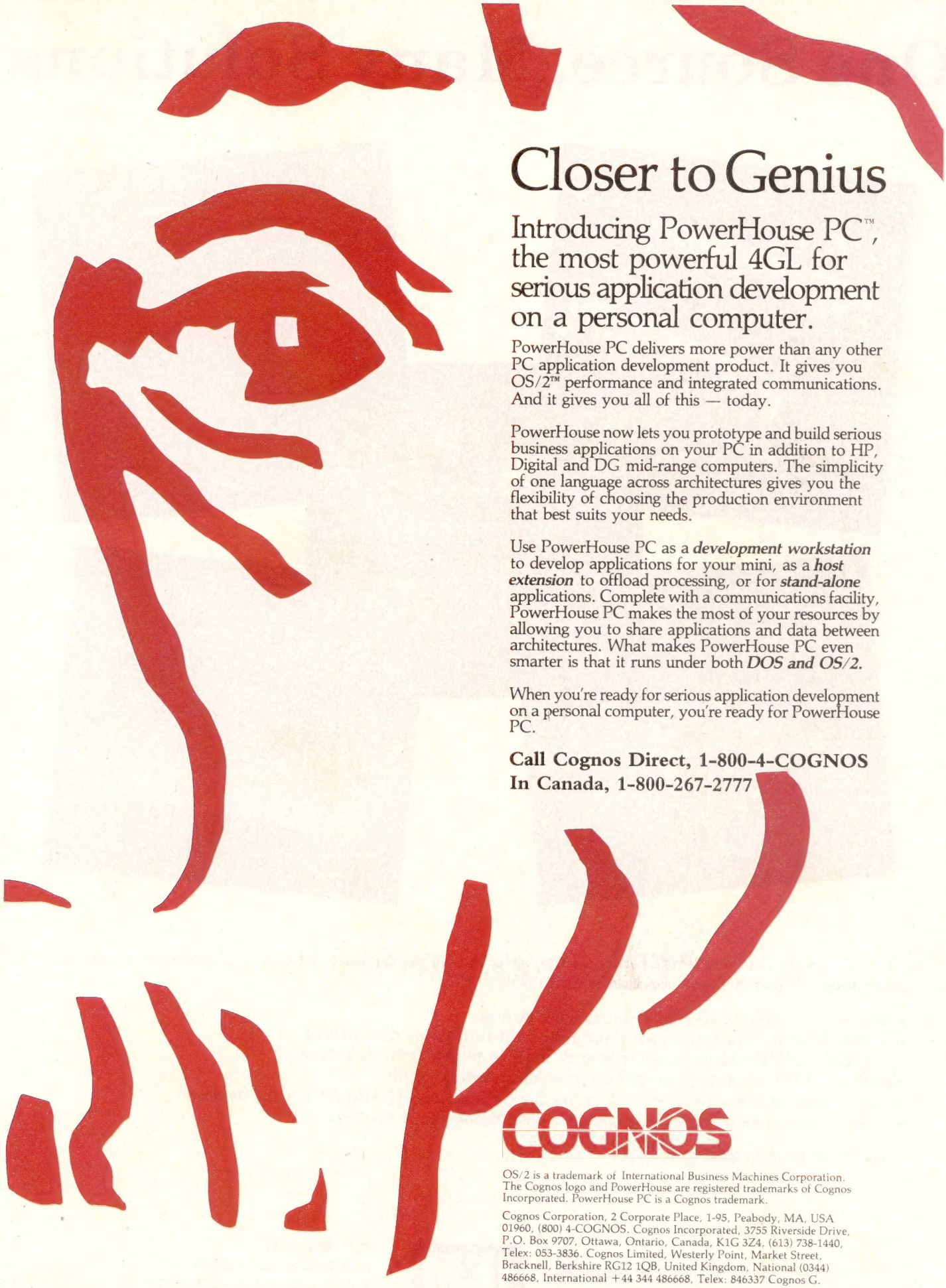

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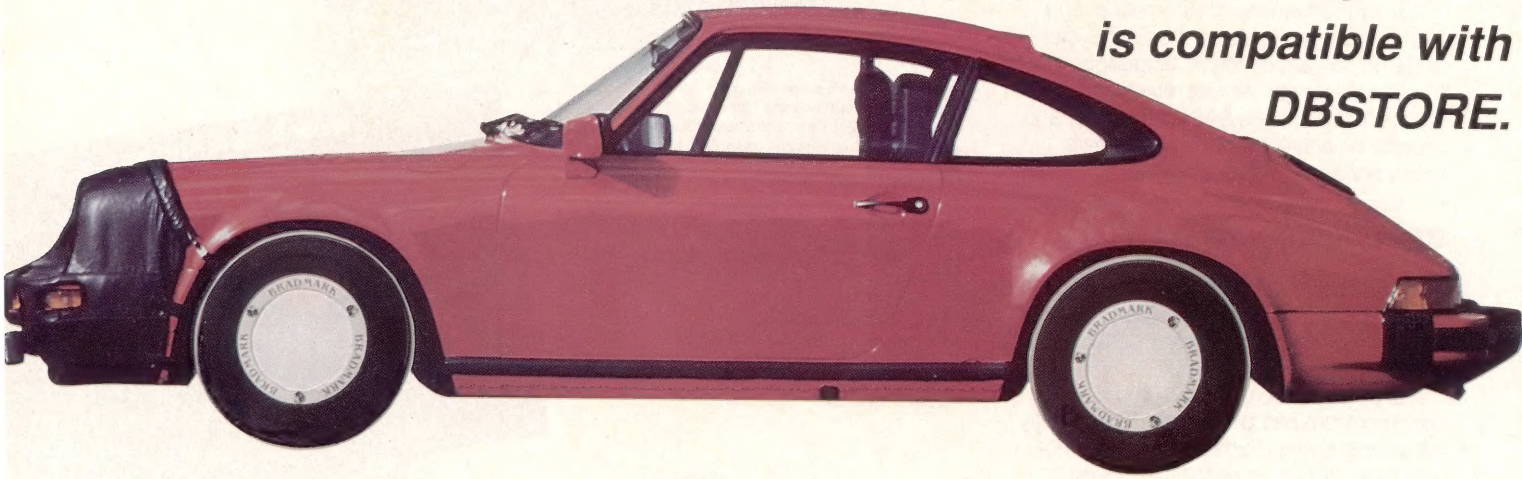

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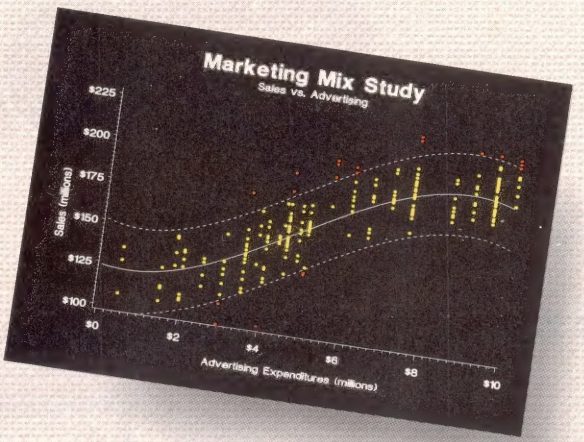

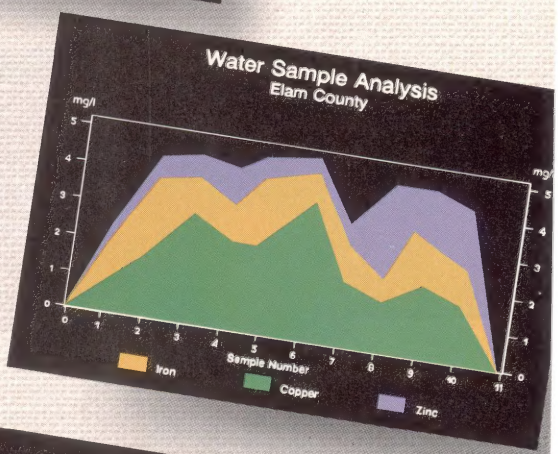

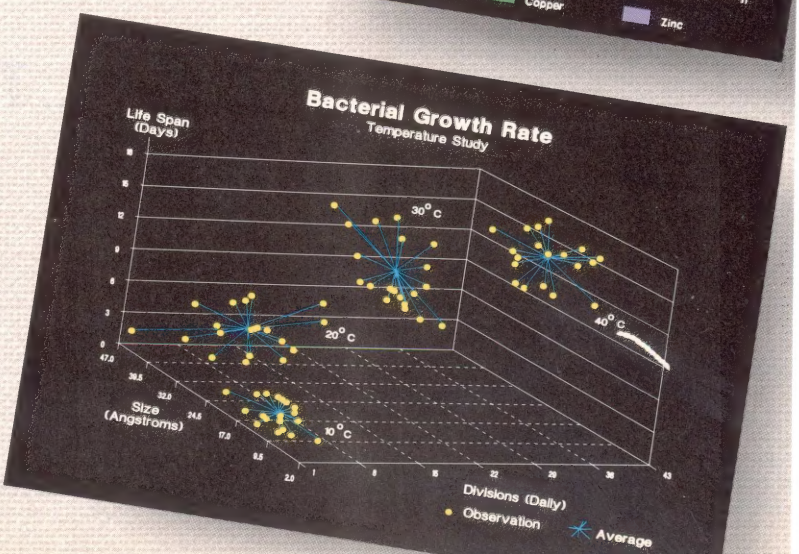

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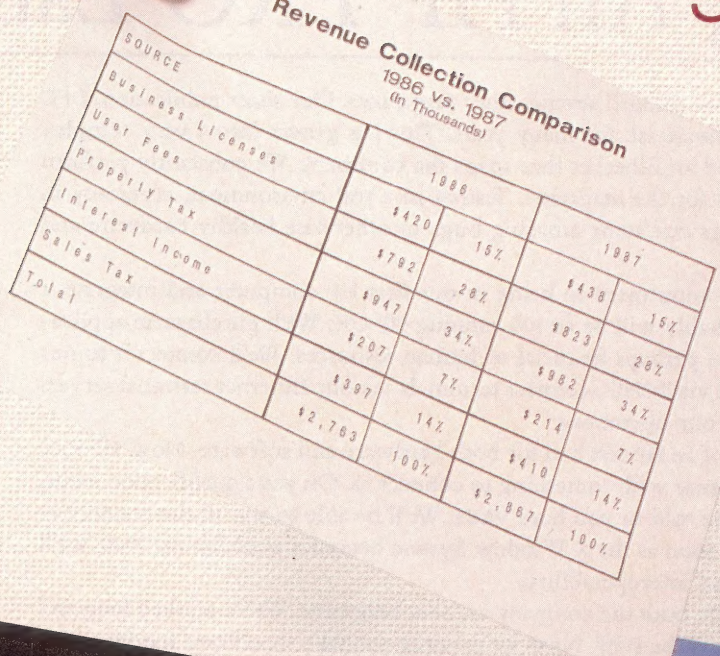

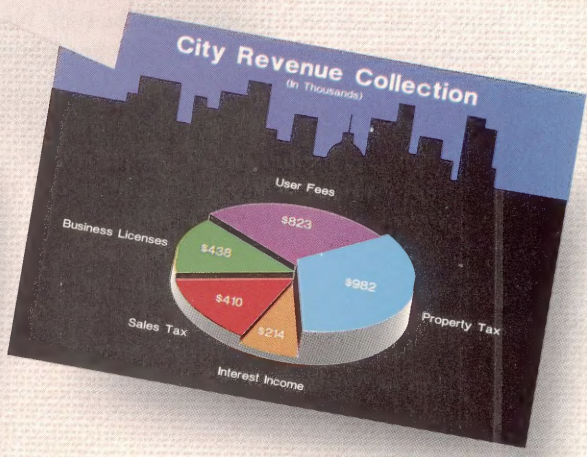

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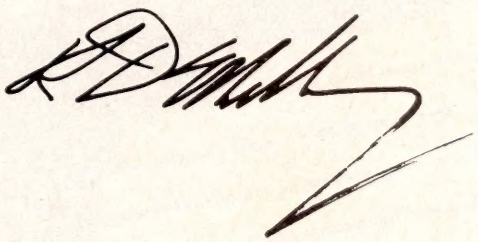
Building An *HP PRO* Lab

As you may or may not know, we publish several other magazines. Our sister publication, *DEC PROFESSIONAL*, has had a hardware lab for many years. This has grown into a very complex cluster-network of six VAXs and an Ethernet that spans the continent. We constantly perform hardware and software reviews for the magazine. Testing in a real environment, especially in a multiprotocol Ethernet, brings out some amazing bugs in otherwise healthy hardware and software.

We now are making the commitment to bring in our first HP computer and integrate it with our network. It most probably will be an 825 running HP-UX. We'll purchase an application to help justify the machine, perhaps financial or human resources. We'll connect it to our Ethernet, bridge it to our VAXs via TCP/IP, connect terminals via our Ethernet terminal servers and generally integrate it into our operations.

This will give us the start of an HP test bed for both hardware and software. Now, HP 9000 workstations will make more sense with something to connect to. On your qualification cards, a very large number of you have told us you have VAXs. We'll be able to test all the connectivity strategies available. And, as soon as the X Window System becomes available on VMS, we'll be able to test the possibility of interoperability.

We're very serious about HP, both the company and our magazine. We've worked long and hard on the editorial product and the staff. Now we're ready to make significant hardware investments to integrate HP iron into our laboratory network.



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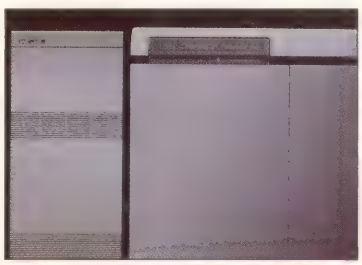

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INDUSTRY WATCH

Ann Marie Lasak

Customer Service, Hewlett-Packard Style

On the morning of June 21, 1988, a group of HP clients, employees, local politicians and the press gathered to witness the ribbon-cutting ceremony of HP's new Customer Support Center in Atlanta. As the day progressed, and the steamy Atlanta temperature kept pace with the ever-increasing humidity, we were led on guided tours of HP's new facility and heard numerous speeches from those who have worked hard to bring HP's commitment to customer service to a worldwide, interconnected reality.

The Support Center, located in the northwest section of the city, is the first HP facility to provide five main support operations at a single location: Customer Network Center; Atlanta hub of the North American Response Center; Customer Education Center; Project Center; and Regional Customer Service Center, a repair depot.

The 111,000-square-foot facility will house more than 350 professional, technical and support workers who serve some 16,000 customers directly and, indirectly, thousands more worldwide.

"By pooling our resources at a single location, HP can continue its tradition of excellence in providing support to its customers," said Michael C. Leavell, vice president and general manager of HP's Customer Support Operations. "This centralized approach means we will be able to share knowledge among ourselves and with our customers more effectively and efficiently."

This sharing of knowledge is readily apparent in the Customer Support Center's floor plan. Support engineers all are within "walking or shouting" distance from each other. In this way a real "team" atmosphere is generated and support engineers are surrounded with the people and equipment that can help them find solutions quickly.

The HP Customer Network Center, one of three in the world, provides design, project management, operation, training and support of customer X.25 private-packet networks.

In addition, the support staff utilizes an entire database worth of customer support solutions that have been compiled from previous customer calls and on-site visits. In this way, each call does not represent a brand new challenge. Many problems can be solved quickly and efficiently using historical data and expert, hands-on experience that has been fully documented and stored on-disc.

Customer Network Center

The Customer Network Center, one of three in the world, provides design, project management, operation, training and support of customer X.25 private-packet networks (a wide-area network that provides the equivalent of a private telephone system specifically for data communications among remote locations).

"Each of our network centers — here, in England and in Singapore — is staffed with network consultants who have technical expertise in wide-area networking in multivendor environments," said Leavell.

The Atlanta and Bristol (England) network centers also are staffed with operators who remotely can manage and operate any multivendor HP private packet network depending on the level of service that the customer wants.

"Many vendors define service as

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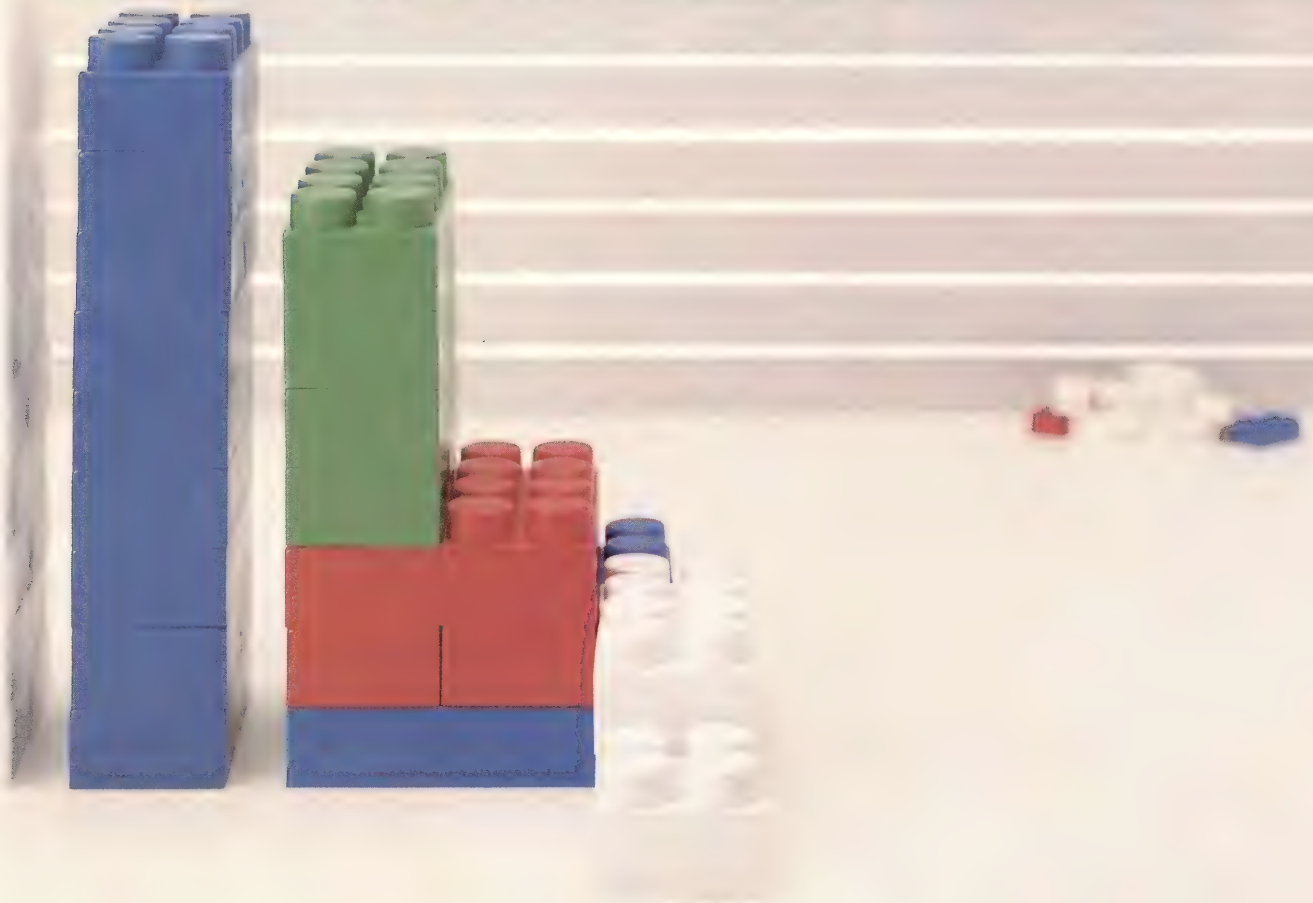

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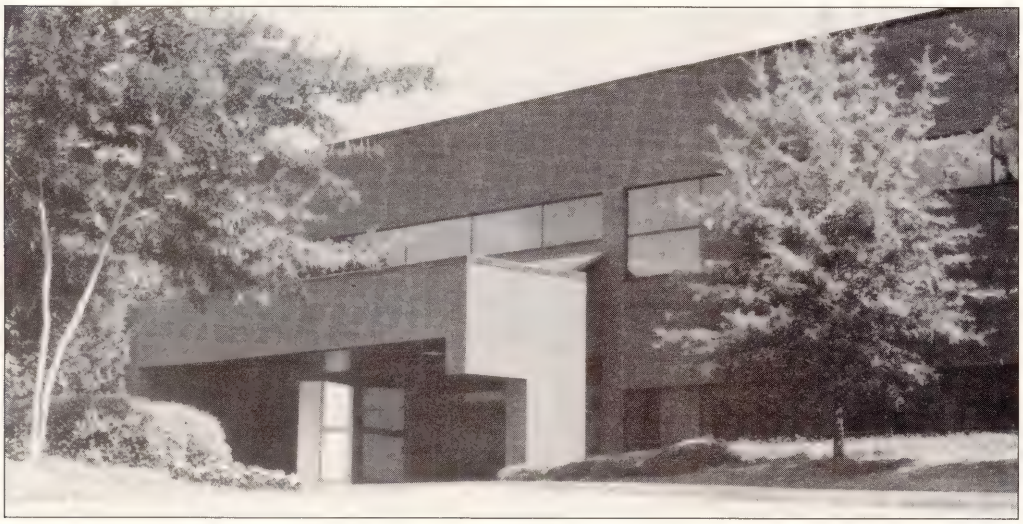

The newest and largest hub of Hewlett-Packard's worldwide support network, the Customer Support Center in Atlanta, Georgia, provides support and educational services for the broad range of HP products, from business and technical computers to medical instruments.

repair; we expand service to include planning, operation and management," said Leavell. "That makes us the major computer vendor to offer complete network-operations services to complement a full range of industry-standard networking products."

By using part of HP's network-support program, customers can supplement their own staff in managing the support activities of a multivendor network.

The Response Center

At the North American Response Center, trained engineers take phone calls from customers, diagnose problems and prescribe corrections for thousands of HP computer, medical and analytical products.

The response center is connected to 31 centers worldwide. Problems and solutions from one center are shared across HP's data-communications network among all centers, giving each almost immediate access to a large pool of support information.

Such shared resources reduce the amount of time HP takes to respond to and solve reported problems.

In addition to its distributed computing resources, HP uses two modern support technologies developed for HP 3000 customers: predictive support and remote diagnostic support.

With predictive support, customer's computer systems automatically dial the response center when error conditions indicate potential system trouble. While the system is still functioning, the calls alert response center engineers that corrective action should be initiated. In turn, the engineer contacts the customer to schedule maintenance during periods of low activity and to prevent unnecessary down time and sudden system crashes from affecting productivity.

With remote diagnostic support, modem connections can be made between HP and customers' computer systems to run tests when a problem occurs. Once the diagnostic check is made, corrective action can be provided over the phone or a service representative can be dispatched with parts already selected. Remote diagnosis reduces expensive repair time and repeat visits by HP field teams.

The Education And Project Centers

Professional instructors at the Customer Education Center teach classes on nearly all of HP's computer and Instrument products and services. Classes are offered to both HP clients and internally to HP employees.

With the ever-increasing focus on user education, HP offers dedicated classrooms and computer equipment to guarantee high-quality, hands-on training.

Application engineers at the Project Center provide the expertise necessary to design, build, implement and maintain tailored multivendor systems solutions for customers.

At a time when 75 percent of American jobs are in the service sector, 71 percent of the GNP is generated by service-related organizations and 80 percent of start-up companies are providing customer service to their clients, HP, along with all major computer vendors, is trying to distinguish itself from the competition. By opening a world-class facility and following through with its well-conceived customer-service strategy, HP has a shot at changing the bad name that customer service gets in our society.

The final testament to the smooth and efficient flow of information through HP's Customer Support Center came when a phony bomb scare forced the entire facility to be evacuated. During the 15 minutes or so that we milled about the parking lot, not one HP customer experienced difficulty in getting his call through to HP Customer Support. All it took was the flip of a switch to forward all calls to the HP Response Center in Santa Clara, CA. Now that's customer support, HP style! ■

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Hocus-pocus. That's what some folks said when we told them BackPack™ could cut the time and tape required for HP 3000 system backup in half. Of course, now that it's done just that at HP sites from here to Hong Kong, most of the doubting Thomases have become loyal fans.

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LaserRom Now Available For HP-UX Workstations

Delivers UNIX Documentation and Support Information

Hewlett-Packard recently announced HP LaserRom, a service that delivers UNIX operating-system documentation and support information on CD ROM for the HP 9000 Series 800 HP-UX computers.

HP LaserRom for HP-UX offers a graphical interface based on MS-Windows that simplifies use of the UNIX documentation. HP LaserRom enables users to electronically search and retrieve information relating to a UNIX operating system ranging from software design and development manuals to support information. Although this new productivity tool is targeted for the Series 800 computer environment, HP LaserRom for HP-UX is applicable to a broader UNIX-system marketplace.

The initial version of HP LaserRom holds the hard-copy equivalent of more than 10,000 pages in electronic form. The service will assist software engineers, systems administrators and general HP-UX users.

According to Marc Hoff, general manager of HP's Application Support Division, "HP LaserRom for HP-UX facilitates better software design and the use of more productive programming techniques because it provides instant access to software design and development information.

"As HP-UX evolves toward the standards embraced by the Open Software Foundation (OSF), our CD ROM-based tools for the UNIX-system environment will evolve in a parallel fashion."

HP LaserRom improves the usefulness and accessibility of the UNIX-system reference manual because HP LaserRom provides full keyword access to the information.

It goes beyond the traditional online "man" command because it contains the full set of HP-UX manuals and support information.

Each significant word on the HP LaserRom disc is indexed. This allows the user to locate instantly specific information by typing in keywords. Users can specify selected words, phrases or topics of interest and the system identifies each occurrence of the specified information.

HP LaserRom also allows the user to access information by browsing. By browsing, the user can find information by migrating from a general table of contents to specific sections of interest.

HP LaserRom for the HP 9000 Series 800 HP-UX computer is $1,800 for a 12-month subscription. The service also can be ordered with a starter kit that consists of a 5¼-inch half-height CD ROM drive. The drive fits into a standard slot in an HP Vectra PC or IBM PC/AT.

If a 12-month subscription is purchased before December 31, 1988, there will be no additional charge for the starter kit. HP estimates that deliveries of the service will begin in December 1988.

LaserROM enables you to electronically search more than 10,000 pages of UNIX documentation.

HP Unveils 9000 Model 360

Based On Motorola MC68030 Microprocessor

Hewlett-Packard became the first major U.S. computer manufacturer to introduce a workstation based on Motorola's new MC68030 microprocessor.

The new HP 9000 Model 360 ($15,550 — $62,950) offers two times the performance at a price only slightly above the HP 9000 Model 330.

Model 360 uses Motorola's 32-bit, state-of-the-art microprocessor and an MC68882 floating-point coprocessor, both running at 25 MHz, to achieve processing speeds of up to 5 MIPS. HP also announced plans to introduce a workstation later this year based on a 33-MHz version of the MC68030. This HP 9000 Model 370 workstation will feature performance of more than 7 MIPS.

"Our ability to move quickly to the newest Motorola microprocessor strengthens HP's price/performance leadership in the market for workstations based on the industry-standard MC68000 architecture," said A. Peter Hamilton, marketing manager for HP's Technical Computer Group.

Hamilton said that HP currently has more than 250,000 Motorola-based systems installed worldwide, and that the announcements underscore HP's continued commitment to this important technology.

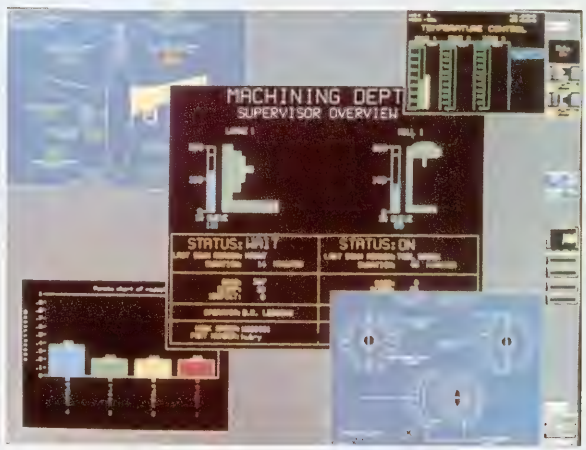
In addition, HP announced that Model 330 customers will be able to convert their systems to the Model 360 with a single-board upgrade kit ($5,950). HP also said that a similar single-board kit ($5,000) will be able to upgrade to a Model 370.

HP's primary design goal for Model 360 was to protect customer investments in software. Customers can transfer their software from existing workstations to Model 360 by verifying their compiled software code with HP-UX 6.2, which adheres to AT&T's UNIX System V Interface Definition Issue 2. This eliminates the need to recompile or port software to Model 360.

Hamilton said that the HP-UX operating system also provides compatibility between Motorola-based HP workstations and the advanced RISC-based HP systems. The two families of workstations also share common graphics systems.

Configurations of Model 360 range from a discless monochrome system with 4 MB of RAM to Model 360 TurboSRX with 8 MB of RAM and HP's industry-leading, high-performance 3-D, solid-rendering graphics subsystem. The TurboSRX offers 1,280- X 1,024-pixel resolution, 24 planes of frame buffer memory and a full 16-bit Z buffer. Model 360 workstation includes as standard a 32-bit system bus, HP-IB (IEEE-488) peripheral interface, direct memory access (DMA) and Ethernet/IEEE-802.3 ThinLan or attachment unit interface (AUI) for network access. The new workstation is expandable from 4 to 16 MB of parity RAM.

Customers also may purchase options for VME bus expansion, SCSI disc interface, DOS coprocessing and an additional floating-point accelerator. In addition to the TurboSRX, the Model 360 workstation supports HP's MH monochrome-graphics or 2-D CH color-graphics subsystems, both with 1,280- by 1,024-pixel resolution. HP also offers a dedicated 2-D color-graphics accelerator that boosts performance to 300,000 vectors per second.



Monitrol/UX Ready For HP 9000

Provides Cell Control And Area Management For HP 9000

Hilco Technologies (St. Louis, MO) and Hewlett-Packard have announced Monitrol/UX, a networked version of Monitrol designed for the HP 9000 family of computers. Since 1979, standalone versions of Monitrol have run on computers using the Rocky Mountain BASIC operating system.

Monitrol software allows manufacturers to have a phased implementation of CIM (Computer Integrated Manufacturing) technology by automating areas of a factory one at a time. Monitrol/UX is based on industry standards such as UNIX, the X Windows System and IEEE-802.3 local area networking.

Any devices and process equipment on the shop floor that have RS-232 serial ports can be linked. Any machine that supports the X Window System can access information from the Monitrol site through the local area network.

Monitrol/UX can be integrated with CAD systems and support software for programmable logic controllers. Online documentation is supported by the HP-UX operating system.

Software Evaluation Program Yields Positive Results

Unison Software Installed At HP Sites

To combat some of the problems of acquiring needed software, Hewlett-Packard launched a program to cut the time spent searching for and purchasing third-party software products. "We wanted to standardize the process," said Paul Haefner, manager for HP Corporate Information System Management Support.

"If we can share the evaluations done by user organizations, it saves HP money," said Haefner. DP managers at HP sites test the products and send their recommendations to corporate headquarters.

The program, HP's "Movement Toward Common Operating Environments," was in part a result of a corporate license agreement signed with Unison Software (Mountain View, CA) in 1986. The agreement covers MAESTRO and its companion product TAPES.

"After evaluating several batch job schedulers, we recommended to HP that they purchase MAESTRO," said Dave Dunkle, associate systems administrator at HP's Loveland, CO, Instrument Division (LID). At HP LID, they found MAESTRO reduces time spent on manual tasks. "Before, we basically single-threaded everything," said Dunkle. "All job completions, job dependencies and verifications had to be monitored manually by the operator. Operators would have to look at a hardcopy schedule and check the list of jobs to see if anything could be run. Then all the dependencies had to be manually checked for jobs completed or files present."

HP LID also has been able to eliminate the need for one operator on both second and third shifts. "Those operators are now working on other projects," said Dunkle.

At HP's Support Material Organization (SMO) in Rocklin, CA, they have a similar story to tell. "HP is involved in a program called Total Quality Control, which is taking a look at a job as a process and determining what improvements need to be made," said Claudia Johnson, Technical Support at SMO. Using the total quality control approach, SMO monitored its processes and discovered that an automatic scheduling system was necessary to achieve more productivity and efficiency. "When we chose MAESTRO, we continued charting our processes and found that systems administrators' scheduling time went down from approximately one hour per day to eight minutes. We also found that our production job failure rate went down an average of 1.3 percent," said Johnson.

Look for similar agreements between HP and third-party software companies as the software evaluation program grows.

Viewpoint Available For Vectra

Provides Project Management Tool

Computer Aided Management (CAM) recently announced it has developed a working relationship with Hewlett-Packard. The Systems Technology sector in HP has selected ViewPoint ($1,995) as its standard project-management system on the Vectra.

Bill Kern, Manager of CAM's Consulting and Support Services, has worked with HP to train its employees and project managers on ViewPoint implementation. According to Kern, "Various project managers became frustrated with the complexities of managing projects and integrating data from several diverse groups. A standard project-manage-ment tool was necessary for HP to implement project management successfully."

Viewpoint allows HP to standardize project management on one system at the single-project manager level. HP is piloting a program to determine if Viewpoint also can be used across HP's divisions at the Lab level (30-100 people) and the Technology Sector level (thousands of people).

Borland Acquires Technology From Surpass Software

Technology To Be Integrated Into Future Versions of Quattro

Borland International (Scotts Valley, CA) announced that the company has signed an agreement with Surpass Software Systems (Novato, CA).

Future Borland spreadsheet products, including Quattro, will be based on leading-edge technology from both Quattro and Surpass. Both products recently have been rated to outperform Lotus 1-2-3, the previous market leader in spreadsheet applications.

"We view the acquisition of Surpass as a means to strengthen our technology base by combining leading engineers and development teams to make our products even better," said Philippe Kahn, Borland chairman and CEO. "This acquisition will allow us to continue to build superior spreadsheet products that will keep Borland and its customers at the forefront of technology."

A limited number of copies of the current version of Surpass as well as customer support will be available through 1988. In addition, Borland announced that owners of Surpass will be able to receive and upgrade to Quattro for $49.95. Borland will offer both Quattro and Surpass users the same upgrade path to a future version of Quattro that will incorporate technology from both products.

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CIRCLE 200 ON READER CARD

Computer Solutions Offers Affordable Disaster Recovery

Services Geared To HP 3000 Users

Computer Solutions (Orange, NJ) recently announced its entry into the Disaster Recovery marketplace as a result of the growing demand for contingency services. Geared specifically for HP 3000 users, CSI's services include both hotsite and portable recovery.

CSI has been a VAR and dealer of remanufactured Hewlett-Packard CPUs and peripherals for nearly 20 years. A large inventory of systems and a staff of experienced personnel make the offering of Disaster Recovery a natural extension for CSI.

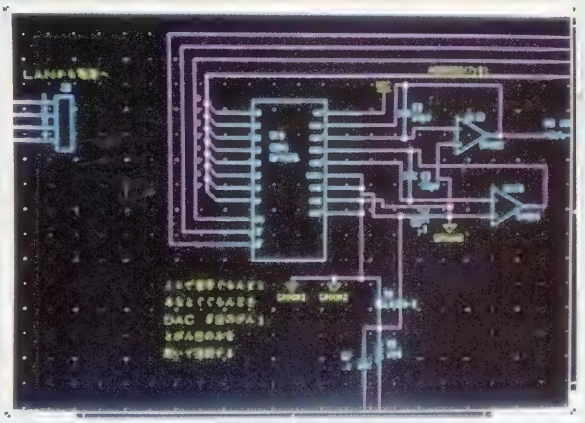
The corporate headquarters houses a pool of systems, large and small, as a hotsite resource. The facility includes optional office space and office equipment as well as a team of field-service and facilities-management personnel that provide the necessary technical support for a smooth disaster recovery operation.

Another hotsite in Southern California already is planned and should open for business by September. As additional hotsites are established, each will be linked back to CSI's home office forming a network via high-speed data lines.

An HP Micro 3000, complete with CRTs, printers, and telecommunications equipment, is the portable recovery alternative. The portable system is shipped to a site of the customer's choosing in the case of an actual disaster.

Recovery procedures are expedited as a result of a 24-hour disaster hotline. The hotline assures subscribers that technical personnel are ready if an actual disaster should occur.

CSI offers Disaster Recovery services at a third of the cost of its competitors.



HP's Kanji version of design capture.

HP Targets Japanese CAE Market

Introduces Kanji Design Capture

Hewlett-Packard recently announced a Japanese Kanji version of the design-capture portion of the HP Electronic Design System. Using either a Katakana (phonetic alphabet) or Kanji (pictographic symbols) keyboard, engineers will be able to annotate their schematics in Japanese and generate reports, such as bill-of-materials, in Japanese headers.

The design-capture portion of the HP Electronic Design System is a sophisticated circuit-design and engineering-documentation package. The Japanese version will support the Japanese Industrial Standards (JIS) I and II (analogous to ASCII in the U.S.).

Japan is an important HP market, especially for CAE software. According to YANO Research Institute Ltd. (Japan), Yokogawa-Hewlett-Packard Ltd. (an HP subsidiary) was the fastest growing CAE company in Japan in 1987, with 66 percent revenue growth.

The Japanese-language version (970,400 Yen, $8,200 U.S.) will allow Japanese customers to generate engineering notes and documentation on their CAE workstations in the local language. As schematic designs progress from engineering to manufacturing and test, information will be conveyed more easily to technicians and other support personnel, reducing the chances for errors.

Cumulus Signs Five Distributors

Ships First Terminals Throughout U.S.

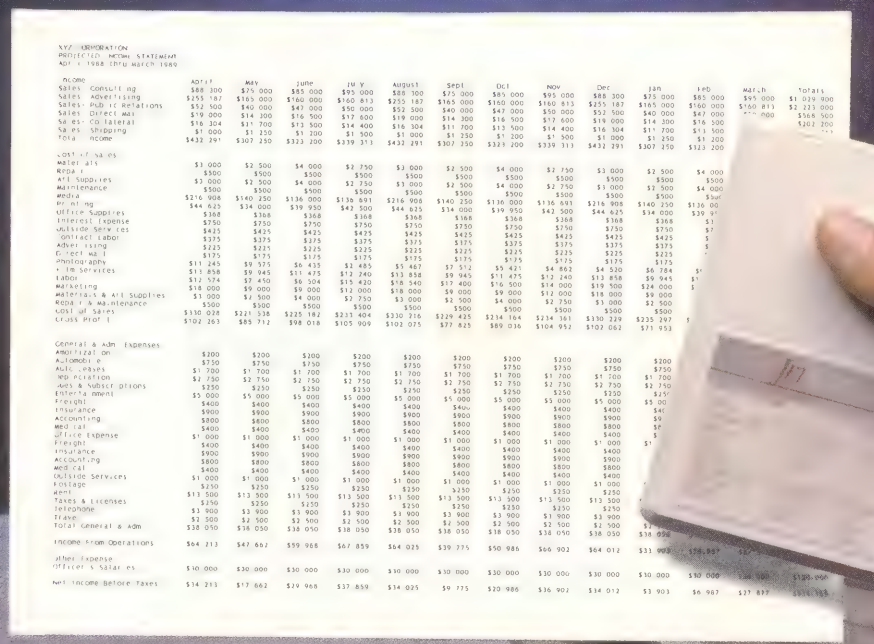
Cumulus Technology is shipping its first product, a letter-quality, alphanumeric display terminal for HP users, to five distributors in the U.S.

Heading the roster are Pacific Data Group (Santa Clara, CA), Pro Com Sales Corporation (Glenview, IL), Lotz Data Products (Harleysville, PA), Marketechs Inc. (Wellesley, MA) and Promark Peripherals Inc. (Ronkonoma, NY).

Cumulus' terminal, the HCT ($795), achieves sharp resolution through optical ergonomic features including a 15-inch paper-white display screen, a 75Hz refresh rate that eliminates flicker and large characters custom-designed to be easily read. It also provides easy-to-use desktop accessories and the industry's first limited five-year warranty.

Cumulus supplies display products to major computer systems manufacturers under private label. The company has an OEM agreement with Unisys to provide high-resolution multisynchronus monitors for use throughout Unisys' PC product line.

1-2-3 8½x11



XYZ CORPORATION
PROJECTED INCOME STATEMENT
April 1988 thru March 1989

Income	April	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	Totals
Sales - Consulting	$88,300	$75,000	$85,000	$95,000	$88,300	$75,000	$85,000	$95,000	$88,300	$75,000	$85,000	$95,000	$1,029,900
Sales - Advertising	$255,187	$165,000	$160,000	$160,813	$255,187	$165,000	$160,000	$160,813	$255,187	$165,000	$160,000	$160,813	$2,223,000
Sales - Public Relations	$52,500	$40,000	$47,000	$50,000	$52,500	$40,000	$47,000	$50,000	$52,500	$40,000	$47,000	$50,000	$568,500
Sales - Direct Mail	$19,000	$14,300	$16,500	$17,600	$19,000	$14,300	$16,500	$17,600	$19,000	$14,300	$16,500	$17,600	$202,200
Sales - Collateral	$16,304	$11,700	$13,500	$14,400	$16,304	$11,700	$13,500	$14,400	$16,304	$11,700	$13,500	$14,400	
Sales - Shipping	$1,000	$1,250	$1,200	$1,500	$1,000	$1,250	$1,200	$1,500	$1,000	$1,250	$1,200		
Total - Income	$432,291	$307,250	$323,200	$339,313	$432,291	$307,250	$323,200	$339,313	$431,291	$307,250	$323,200		
Cost of Sales													
Materials	$3,000	$2,500	$4,000	$2,750	$3,000	$2,500	$4,000	$2,750	$3,000	$2,500	$4,000		
Repair	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500		
Art Supplies	$3,000	$2,500	$4,000	$2,750	$3,000	$2,500	$4,000	$2,750	$3,000	$2,500	$4,000		
Maintenance	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500		
Media	$216,908	$140,250	$136,000	$139,691	$216,908	$140,250	$136,000	$139,691	$216,908	$140,250	$136,00		
Printing	$44,625	$34,000	$39,950	$42,500	$44,625	$34,000	$19,950	$42,500	$44,625	$34,000	$39,95		
Office Supplies	$368	$368	$368	$368	$368	$368	$368	$368	$368	$368	$3		
Interest Expense	$750	$750	$750	$750	$750	$750	$750	$750	$750	$750	$7		
Outside Services	$425	$425	$425	$425	$425	$425	$425	$425	$425	$425	$		
Contract Labor	$375	$375	$375	$375	$375	$375	$375	$375	$375	$375	$		
Advertising	$225	$225	$225	$225	$225	$225	$225	$225	$225	$225			
Direct Mail	$175	$175	$175	$175	$175	$175	$175	$175	$175	$175			
Photography	$11,245	$9,575	$6,435	$2,485	$5,467	$7,572	$5,421	$4,862	$4,520	$6,784	$		
Film Services	$15,858	$9,945	$11,475	$12,240	$13,858	$9,945	$11,475	$12,240	$13,858	$9,945	$		
Labor	$12,574	$7,450	$6,504	$13,420	$18,540	$17,400	$16,500	$14,000	$19,500	$24,000	$		
Marketing	$18,000	$9,000	$9,000	$12,000	$18,000	$9,000	$9,000	$12,000	$18,000	$9,000			
Materials & Art Supplies	$1,000	$2,500	$4,000	$2,750	$3,000	$2,500	$4,000	$2,750	$3,000	$2,500			
Repair & Maintenance	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500			
Cost of Sales	$330,028	$221,538	$225,182	$231,404	$330,316	$229,425	$234,164	$234,361	$330,229	$235,297			
Gross Profit	$102,263	$85,712	$98,018	$105,909	$102,075	$77,825	$89,036	$104,952	$102,062	$71,953			
General & Adm Expenses													
Amortization	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200			
Automobile	$750	$750	$750	$750	$750	$750	$750	$750	$750	$750			
Auto Leases	$1,700	$1,700	$1,700	$1,700	$1,700	$1,700	$1,700	$1,700	$1,700	$1,700			
Depreciation	$2,750	$2,750	$2,750	$2,750	$2,750	$2,750	$2,750	$2,750	$2,750	$2,750			
Dues & Subscriptions	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250			
Entertainment	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000			
Freight	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400			
Insurance	$900	$900	$900	$900	$900	$900	$900	$900	$900	$900			
Accounting	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800			
Medical	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400			
Office Expense	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000			
Freight	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400			
Insurance	$900	$900	$900	$900	$900	$900	$900	$900	$900	$900			
Accounting	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800			
Medical	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400			
Outside Services	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000			
Postage	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250			
Rent	$13,500	$13,500	$13,500	$13,500	$13,500	$13,500	$13,500	$13,500	$13,500	$13,500			
Taxes & Licenses	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250			
Telephone	$3,900	$3,900	$3,900	$3,900	$3,900	$3,900	$3,900	$3,900	$3,900	$3,900			
Travel	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500			
Total General & Adm	$38,050	$38,050	$38,050	$38,050	$38,050	$38,050	$38,050	$38,050	$38,050	$38,050			
Income From Operations	$64,213	$47,662	$59,968	$67,859	$64,025	$39,775	$50,986	$66,902	$64,012	$33,903			
Other Expense													
Officer's Salaries	$10,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$10,000			
Net Income Before Taxes	$14,213	$17,662	$29,968	$37,859	$34,025	$9,775	$20,986	$36,902	$34,012	$3,903			

At last!

For users of the HP LaserJet and Canon laser printer, JetFont 123 is making greenbar paper obsolete.

JetFont 123 produces remarkably clean laser output from Lotus 1-2-3, dBase III and other popular database/spreadsheet programs. On 8½" x 11" paper. With four font sizes, as dense as 30 characters per inch!

JetWare's proprietary Lotica font was designed for exceptional readability, making it perfect for extra-wide spreadsheets and database tables. Horizontal or vertical, up to 240 columns wide. With outstanding visual clarity, even after it goes through the copy machine.

Manufactured by Computer Peripherals, Inc., a leader in IBM XT/AT enhancement products since 1982, the JetWare line includes a full range of font cartridges and memory expansion boards for HP LaserJet.

Jim Seymour of PC Week has called JetFont 123 "the answer to our prayers." You'll call it indispensable.

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CIRCLE 210 ON READER CARD

Announcing HP ALLBASE/4GL

Available On HP 3000 Series 900s

Hewlett-Packard recently announced the availability of its fourth-generation language (4GL) on its high-performance HP 3000 Series 900 Precision Architecture (HP-PA) computers.

HP ALLBASE/4GL offers increased functions for program development with HP ALLBASE, which includes an industry-standard SQL database-management system (DBMS) and a network-model DBMS for the HP 3000 family of business computers. With the addition of HP ALLBASE/4GL, customers now can have a 4GL that is tightly integrated with the HP ALLBASE DBMS.

"Combined with our current query and reporting product on the 900 Series, we have a complete relational-database environment that takes advantage of the high performance of HP-PA computers," said Robert F. Stamps, marketing manager of HP's Commercial Information Management Marketing.

Previously available as HP Today on the HP 9000 Series 800 multiuser technical computers, the same 4GL now is available across the range of HP-PA systems for both general-business and technical applications.

"A person with an HP 9000 Series 800 with HP-UX can develop applications with HP Today and process them without any changes using HP ALLBASE/4GL on an HP 3000 Series 900."

HP ALLBASE/4GL will be available in the fourth quarter of 1988 in two versions: a developer version ($20,000 — $44,000) and a run-time only version ($4,100 — $8,900). Product orders can be placed July 1, 1988.

Initially, HP ALLBASE/4GL will support only the HP SQL portion of the HP ALLBASE DBMS. Future support is planned for Turbo-IMAGE, the network-model portion of HP ALLBASE.

HP Introduces Solids-Rendering Graphics Workstation

Unveils 9000 Model 319SRX

Hewlett-Packard recently introduced the HP 9000 Model 319SRX to break price/performance barriers for solids-rendering graphics workstations.

The new workstation combines HP's SRX graphics-accelerator technology with 32-bit HP-UX system processing to provide the fastest and most interactive workstation in its class.

The Model 319SRX can be configured as a single standalone workstation, or as a discless node in a network driven by another HP 9000 HP-UX computer system, including the new Motorola MC68030 microprocessor-based HP 9000 Model 360.

"We designed Model 319SRX to give the engineers the best price/performance in the solids-rendering marketplace," said A. Peter Hamilton, marketing manager of HP's Technical Computer Group. "This workstation offers users the ability to move from line drawings to full 3-D product renderings." Model 319SRX ($25,000) features Motorola's MC68020 microprocessor running at 16.7 MHz with an MC68881 floating-point coprocessor. The new workstation offers 4 MB of high-speed synchronous RAM that can be expanded to 16 MB for more complex applications.

In addition, Model 319SRX uses the same SRX graphics subsystem used in the HP 9000 Model 350SRX, 825SRX and 835SRX systems, and is object-code compatible with Model 350SRX. This HP graphics subsystem offers 1,280- by 1,024-pixel resolution on a 16-inch monitor. The new workstation also supports a complete range of graphics-software libraries, including Starbase (CGI-based), Starbase Display List, PHIGS and GKS.

Model 319SRX incorporates standard interfaces, including the HP-IB (IEEE-488) interface bus with direct-memory-access (DMA) support and disc access RS-232C, and HP-Human Interface Link. In addition, it supports ThinLan (IEEE-802.3/Ethernet).

A standard system includes a 16-inch color monitor, eight planes of frame-buffer memory, 4 MB of RAM, a 16-bit Z buffer strip, keyboard and software licenses to use HP-UX, NFS and NS/ARPA.

Options include up to 24 planes of frame buffer memory for greater color selection and resolution, a full 16-bit Z buffer and a 19-inch color monitor. ■

HI-COMP and S/S/T Sign Distribution Agreement

Establish Joint Support Center

HI-COMP AMERICA recently has entered into a distribution agreement with Software Systems Technology, Inc. (New York, NY).

S/S/T, a well known HP VAR and supplier of financial software and consulting services, will distribute the entire HI-COMP product line from its offices in New York, New Jersey and Washington, D.C.

Additionally, HI-COMP and S/S/T are jointly establishing a support center to aid S/S/T customers in planning their future backup and database strategies.

The decision by S/S/T to distribute the HI-COMP product line was made after S/S/T discovered that HICOMP's HIBACK/3000 cut the nightly backup time on its system almost in half and reduced the amount of tape used by close to 70 percent.

Struggling to get HP data into Lotus?

There is an easier way.

It should be simple. Extracting corporate data from your HP3000 and downloading it to a Lotus™ spreadsheet is simple in theory. But doing it is anything but simple.

Lotus users now have to exit the spreadsheet program, log-on to the HP, extract the records of interest (usually with lengthy serial and chained reads of the database), download the records to the PC, import them into Lotus, then modify the existing spreadsheet format to accept the incoming data. Simple in theory. Slow and cumbersome in practice.

Introducing OMNIVIEW.

OMNIVIEW turns theory into reality. With one simple Lotus function (e.g. @ODXSUM), you can instantly select the records of interest, sum them on the HP, and import the total directly into the designated spreadsheet cell. With OMNIVIEW, users can access corporate data instantly ***from within Lotus 1-2-3.***

Because OMNIVIEW is a Lotus Add-in, users design spreadsheets using familiar Lotus syntax. And because OMNIVIEW uses OMNIDEX, records can be selected instantly, regardless of the database size. Summary financial reports and sales forecasts can now be prepared in a fraction of the time it takes using currently available products.

LOTUS 1-2-3 and OMNIVIEW. The "definitive" financial report writer for accounting systems on the HP.

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In the midwest: (312) 505-1600
DISC Europe (UK): 0372-386838

™ Lotus 1-2-3 is a registered trademark of Lotus Development Corporation.

CIRCLE 131 ON READER CARD

NEW PRODUCTS

Collier-Jackson Offers Systems For HP-PA

Native mode versions of Collier-Jackson Inc.'s financial accounting, human resource and newspaper management systems are now available for operation on all of HP's Precision Architecture (HP-PA) systems. Collier-Jackson plans to continue support for all products across the entire HP 3000 product family in Classic and Precision Architecture native mode versions.

Collier-Jackson has served as a beta site for the new architecture since July 1987, which helped the company prepare for native mode in time for HP's market introduction of the technology.

HP also has extended Collier-Jackson's beta testing period in order to test future HP-PA operating system releases at the company's corporate headquarters.

With the current Precision Architecture, the vendor expects its software to perform two to 10 times more efficiently.

Contact Collier-Jackson, 3707 West Cherry St., Tampa, FL 33607; (813) 872-9990.

Circle 400 on reader card

IMF/1000 Enhanced For HP 1000

Comsci Data Systems has announced an enhancement of IMF/1000, its maintenance software for HP's IMAGE/1000 database system.

IMF/1000 performs online database maintenance and disaster recovery on HP 1000 IMAGE-based systems, and is used extensively in manufacturing and industrial environments where system up-time is essential to plant operations.

With IMF/1000, database characteristics, such as record size, field format and data paths, can be modified without unloading and then reloading the data. Additionally, repairs to the database structure quickly can be made after a disaster, such as a power outage or a disc crash.

IMF/1000 can change database capacity, locate and repair broken indexes, modify paths between datasets, modify fields and change data characteristics. The IMF/1000 also restores linkages or pointers between records in a damaged database.

The new version of IMF/1000, Version 3.0 ($2,500 — $5,000), features Quicklink, which analyzes the database during normal activity and determines the linkages that have been damaged. Only the selected links are repaired, restoring the database to full integrity.

Contact Comsci Data Systems, P.O. Box 20101, Atlanta, GA 30325; (404) 352-3533.

Circle 399 on reader card

HP Creates New Emulators/Analyzers

HP has combined its new HP 64700 emulation technology with its logic analyzer on a chip to create high-performance microprocessor development tools for the TMS32020 and TMS320C25 digital signal processors from Texas Instruments.

The new products are members of the HP 64700 series emulators/analyzers. They consist of standalone, in-circuit emulators and emulation bus analyzers for TMS32020 and TMS320C25. Also available is a fully integrated 16-channel analyzer that functions as a 100-MHz state analyzer and a 25-MHz timing analyzer.

The tools are host-independent and can be operated by most computer systems or a basic terminal. Third-party compiler vendors provide integrated high-level languages on a variety of hosts. Special user interfaces are available for IBM PCs and compatibles, including the HP Vectra PC, and HP 9000 Series 300 technical workstations.

Contact the Hewlett-Packard sales office listed in the white pages of your telephone directory.

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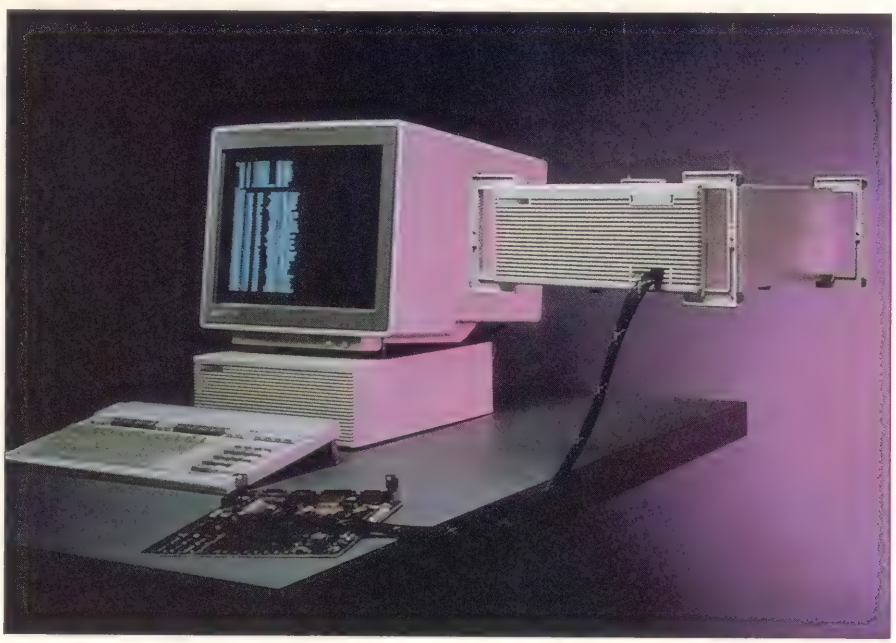

HP provides terminal emulation for TMS32020/C25.

NEWPORT Moves LaserJet Into Mainframe Market

Local Data Incorporated recently announced NEWPORT, a miniaturized protocol converter that plugs into the HP LaserJet Series II printer to provide direct connection with IBM mainframe systems.

NEWPORT slips into the Optional I/O slot found at the rear of the LaserJet Series II and, for most applications, will operate out-of-box. Host software doesn't need modification for immediate printing in IBM 3287 printer emulation mode. All LaserJet features, including HP's PCL, are accessible via NEWPORT, using host commands.

NEWPORT is completely configurable from the host for dynamic selection of printer and interface parameters. User-configured settings can be assigned to non-volatile EEPROM memory for permanent storage.

NEWPORT ($895) is compatible with the majority of IBM-supplied host software, including MVS, VSE, VM, BTAM, VTAM, CICS, IMS, TSO, CMS, JES/328X print facility and VTAM printer support package.

Graphics printing is available through user-developed host programs and a variety of third-party host application software packages, including SAS System (SAS Institute), CA-TELLAGRAF (Computer Associates) and MD-GRAFTEXT (Maersk Data S/A). The maximum print speed of the LaserJet Series II is available via NEWPORT in both text and graphic modes.

NEWPORT will operate with any IBM- or plug-compatible mainframe. A PC program supplied with each NEWPORT unit works with IBM PCs or compatibles equipped with micro-to-mainframe file transfer capability to provide rapid selection of configuration parameters for NEWPORT and LaserJet.

NEWPORT supports all LaserJet options including expanded memory and font cartridges. Both serial and parallel ports can be used with NEWPORT.

Contact Local Data Inc., 2771 Plaza Del Amo, Torrance, CA 90503; (213) 320-7126.

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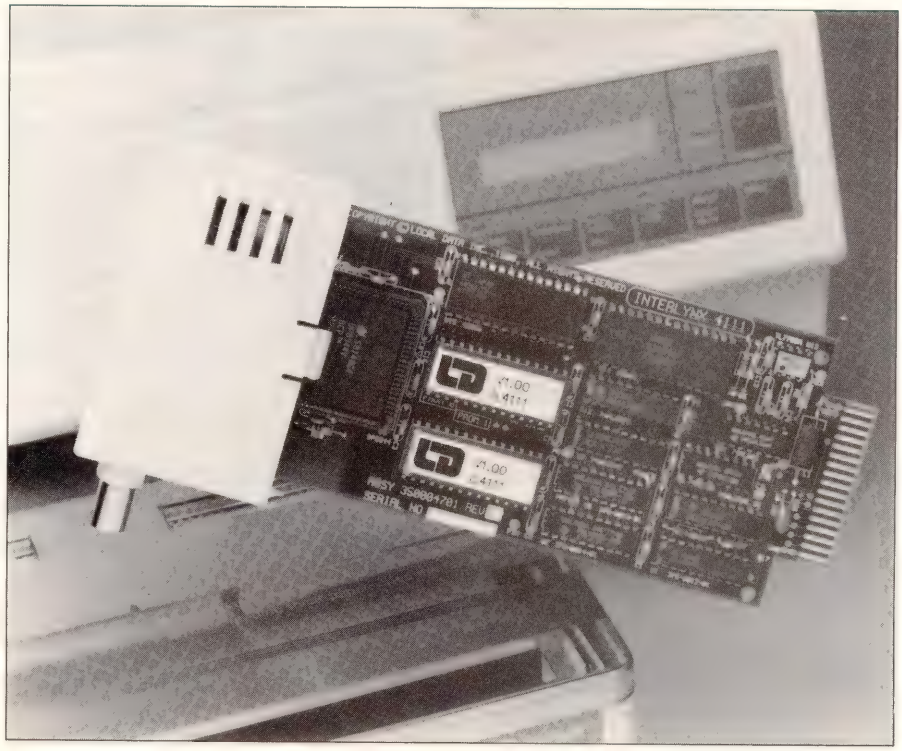

NEWPORT provides IBM 3287 printer emulation for the HP LaserJet series II printer.

PathFinder Provides Project Management

Hillary Software Incorporated has announced PathFinder, a project management system for HP 3000 and 9000 Series 800 systems.

PathFinder, which provides a multiuser planning environment, has been in use for over 10 years on HP 1000 and 9000 Series 200 and 300 systems. The product is graphically oriented and menu driven. The graphics interface is the same across all HP platforms. The input and output produced by a user running PathFinder in MPE, RTE or HP-UX operating systems is identical.

PathFinder provides the ability to accurately create "real-world" timetables and schedules through mathematical manipulation of Optimistic, Pessimistic and Best Guess time estimations. It pinpoints potential trouble spots. Resulting GANTT schedules stand up to expected delays. Management decisions can be made to resolve potential difficulties before they actually occur.

PathFinder allows resource tracking without overwhelming detail. Resource leveling is done by the manager, not through unproven and/or unknown algorithms. PathFinder supports all HP plotting devices.

Contact Hillary Software Inc., 309 Morris Ave., Spring Lake, NJ 07762; (201) 974-8484; outside NJ (800) 445-5279.

Circle 397 on reader card

Striped Lightning For Shop Floor Management

Peripheral Software Concepts Incorporated has introduced the Striped Lightning shop floor management system for the HP 3000 Series 900.

The system features real-time data collection modules that address time and attendance, shop-floor labor collection, pre-payroll processing, security access control, serialized lot and inventory tracking and material control via portable data collection devices. The products are designed to provide management with a means to increase the overall productivity of routine daily operations by reducing errors and speeding up data entry.

Peripheral Software provides both the hardware and software required to install a data collection system. The system requires minimal data processing experience and can be phased in gradually, owing to the modular design of the applications. All modules are integrated using a common database.

Full documentation consisting of a system users' manual is included with each system. A software maintenance service is

available on an annual basis and consists of phone-in consulting assistance, program warranty, documentation updates and product enhancements.

The system supports various data collection devices such as bar-code readers, laser scanners, display terminals, voice response systems, portable hand-held readers and radio frequency devices.

Contact Peripheral Software Concepts Inc., 600 Johnson Ave., Bohemia, NY 11716; (516) 563-7000.

Circle 395 on reader card

GALCON Controls Multiple HP 3000s

Carolian Systems International Inc. recently announced GALCON, a product that provides a unique solution to the operational difficulties experienced while managing multiple HP 3000s.

GALCON gives you the power to monitor and control system activity on any HP 3000 from one central machine. It allows you to examine operational messages and issue and respond to the console commands from any HP 3000, giving you the ability to efficiently manage all your HP 3000s, whether they're local or remote, standalone or networked.

Because centralization is now possible, GALCON allows you to implement uniform operating procedures and parameters throughout a distributed HP 3000 environment. It also can be used to automate your entire operations. GALCON can be programmed to respond automatically to any console message and to interface with any user program that's external to GALCON. This capability makes it possible to respond to remote console messages without user intervention.

Contact Carolian Systems International Inc., 3397 American Dr., #5 Mississauga, Ontario L4V 1T8; (416) 673-0400; FAX: (416) 673-7030.

Circle 394 on reader card

EEsof Introduces Microwave Simulator

EEsof Inc. recently introduced OmniSys, a new CAE program that simulates microwave systems.

OmniSys utilizes component vendor catalog data, internal component models and external file component data to simulate linear and nonlinear microwave systems in the frequency domain, and linear control loops in the frequency and time domains.

OmniSys addresses the needs of microwave system engineers and model radios, radars, EW systems, receivers, transmitters, RF/IF strips and feedback control loops, allowing the user to observe system-response simulations for swept frequency, swept power, multitone intermodulation, noise parameters, mixer spurious intermodulation, link parameters and linear control loops. Throughout the system, simulations of all mismatch effects are included; a budget table in a spreadsheet form also is available for observation of system performance at internal nodes. System tuning and optimization can be performed on many output parameter options.

EEsof's OmniSys performs microwave system simulations for linear and non-linear microwave systems and subsystems.

OmniSys files are compatible and directly supported by ANACAT, EEsof's computer-aided test program, EEsof's circuit simulators (Touchstone, Microwave SPICE, Libra) and E-Syn, EEsof's matching network and filter synthesis program. The ability to utilize these common data files allows the user to achieve a top-down approach to system design.

OmniSys ($12,000) is available on the HP 9000 Series 300, IBM PCs and PC compatibles under MS-DOS and OS/2, Apollo, Sun Microsystems and DEC VAX (fourth quarter 1988).

Contact Donn Mutch, EEsof Inc., 5795 Lindero Canyon Rd., Westlake Village, CA 91362; (818) 991-7530.

Circle 392 on reader card

NEXPERT OBJECT Ported To HP Workstations

Neuron Data has announced the availability of NEXPERT OBJECT for the HP 9000 Series 300 and 800 technical workstations.

NEXPERT OBJECT is the first C-based expert system shell to provide the open architecture and graphical user interface required to build successful commercial applications.

NEXPERT's graphical user interface provides pop-up menus, icons and point-and-pick-style commands. It also provides graphical browsing mechanisms and graphical editors. Objects, rules and their relationships are viewed graphically, providing users with a coherent view of the knowledge base. NEXPERT's graphical interface integrates visual screens with the reasoning process, making it easier to build, visualize, browse, review and debug the rules,

Continued on page 86.

Bering's solution series.

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The all new 5¼ inch format means even more convenience and continued reliability.

And Bering's new 2000MB Tape backup subsystem can handle any back-up need. State-of-the-art helical scan technology ensures efficient, error free backup.*

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Brad and Morgan just solved your

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Meet Brad Tashenberg, President of Bradmark Computer Systems, and Morgan Jones, President of Tymlabs Corporation. Bradmark's DBGENERAL™ is the leading database maintenance and management tool on the market today. And Tymlabs is the company behind BackPack,™ the high-speed replacement for HP's SYSDUMP, STORE, and DBSTORE that has revolutionized system backup since its introduction in 1985.

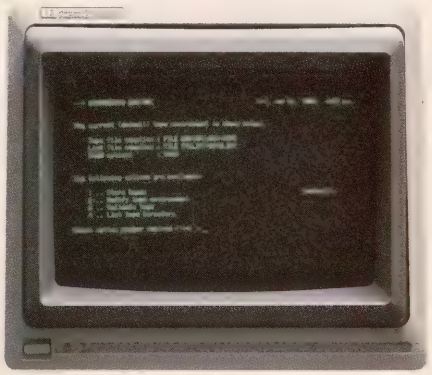
Choose Option 7 from DBGENERAL's main menu to select STORBASE

Brad and Morgan have just agreed to make life a lot simpler for thousands of IMAGE users. They've decided to add the high-speed, compressed backup technology of BackPack to DBGENERAL, with a new DBGENERAL module called STORBASE.™

A little bit of BackPack in every byte.

STORBASE uses BackPack's high-speed file access and parallel processing techniques to harness CPU power normally unused during store operations. So like BackPack, STORBASE can reduce backup time by up to 35% or more on high-speed tape drives and 50% or more on 1600 BPI models. What's more, STORBASE applies BackPack's data compression algorithm and uses its revolutionary tape format to cut tape requirements in half. And unlike HP's DBSTORE, STORBASE lets you back up all your databases on a single tape or tape set. (DBSTORE requires a separate tape for each one.) The ability to back up any number of databases on one tape set further reduces tape use and storage requirements, while vastly simplifying data center operations. And because STORBASE resets the "dirty bit" and updates the date and time stamp in the root file of each database stored, it is fully compatible with HP's transaction logging and recovery facilities. Just as with DBSTORE, you can start a new log cycle after each backup.

If you're concerned about disaster recovery and/or sharing data with installations that don't use either STORBASE or BackPack, you'll be pleased to know that STORBASE tapes can be restored on any HP 3000, using the restore module conveniently placed at the front of each tape set.



Then simply enter the names of your databases and mount a tape.

DB GENERAL STORBASE

The bottom line.

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Call the Bradmark office nearest you to purchase STORBASE. If you are interested in BackPack and are not currently using DBGENERAL, call Tymlabs.

When good people work together, good things happen.

STORBASE. From Bradmark and Tymlabs.

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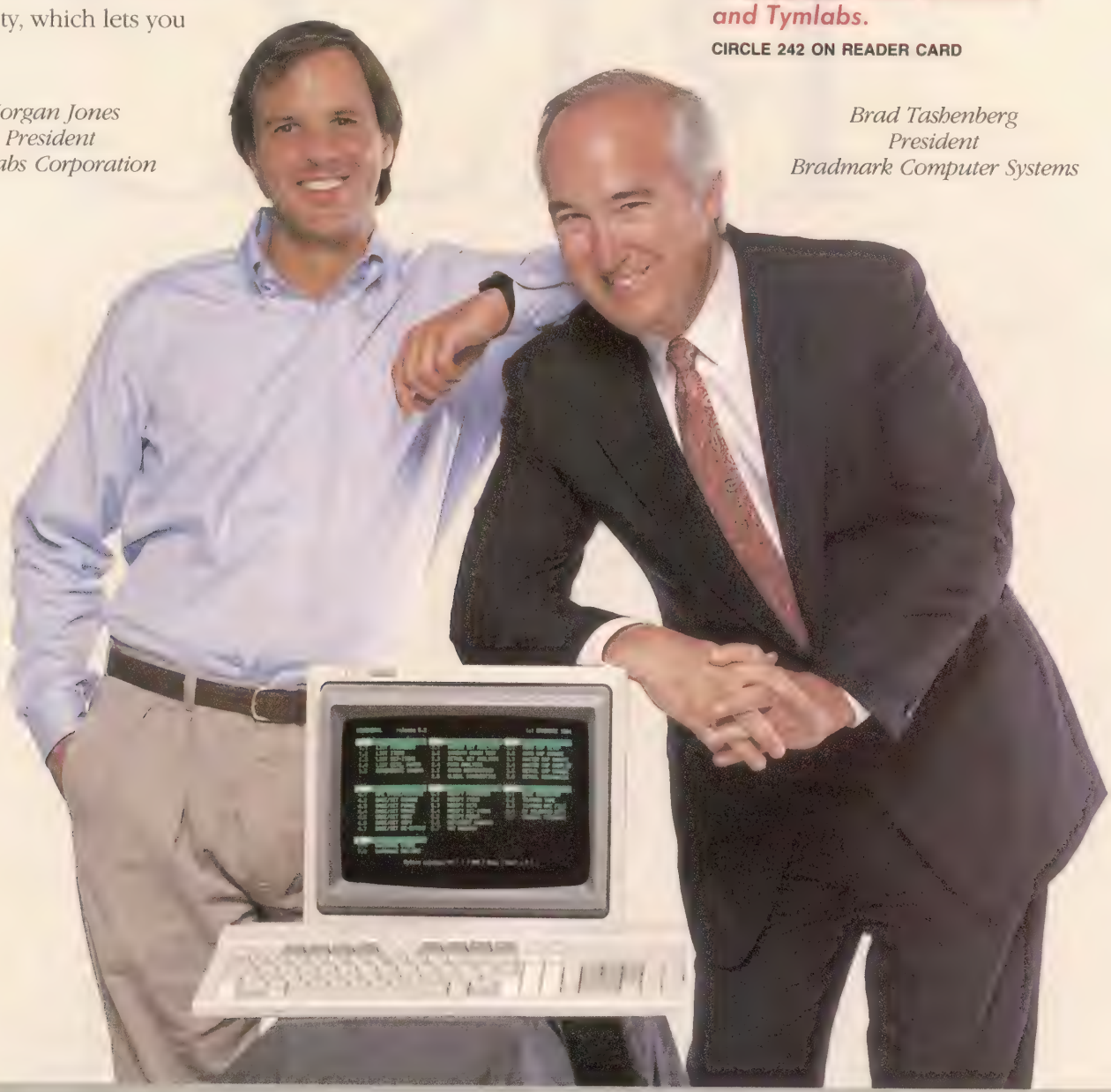
Morgan Jones
President
Tymlabs Corporation

Brad Tashenberg
President
Bradmark Computer Systems



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From The Historical Beginning
To Current Design

RISC

[By Larry Kemp]

In February 1986, Hewlett-Packard announced that Reduced Instruction Set Computer (RISC) architecture would be the way of the future for computer system development across all product lines. What was unique about that announcement was that HP was the first major computer company to make a commitment to RISC.

HP is certainly not alone in bringing RISC products to market. Other companies, Sun and Pyramid to name just a few, have successfully created RISC-based products. HP is still the only major computer company to have made the investment in a commercially oriented operating system to accompany a RISC-based system. Other major computer companies are known to have ongoing RISC investigations.

The primary emphasis of RISC architecture is an extreme improvement in the price-performance ratio. A secondary effect is that RISC processors can be built using fewer components than conventional designs. This results in substantially better reliability, a corresponding reduction in maintenance costs and high performance delivered in conventional packaging. RISC architecture extends the performance in conventional NMOS designs, resulting in single-processor, high-end systems that fit into office environments.

The concepts behind RISC have been around for over a decade. Let's take a look at RISC architecture from historical beginnings to current RISC design and implementation.

TODAY'S CONVENTIONAL ARCHITECTURE is known as Complex Instruction Set Computer, or CISC, architecture. In 1961, IBM set a standard for computer systems in creating a rich and powerful instruction set in the IBM 360 series. That instruction set was carried forward into what today includes the high-end IBM 3090 series and also the lower-end IBM 9370 series. The general concept of a rich and powerful instruction set is present in nearly all popular middle to large size systems today. This includes both the HP 3000 and VAX architectures.

The motivation behind complex instructions is that when the number of instructions required to perform a given task can be reduced, the performance will improve. For example, a table search implemented in a single instruction should require less execution time than a number of simpler instructions. Substitution of a complex instruction for several simpler instructions should reduce the number of instruction fetches and decodes, and result in an overall reduction in the number of cycles required to perform a given task.

Implementation of a large instruction set using hardwired logic would have been prohibitively expensive, so the concept of microprogrammed logic was created. In the microprogrammed implementation, a small, high-speed control store is used to store machine primitive instructions. The control program, or microcode, retrieves and executes the complex external instruction set. The microprogram is, in effect, an interpreter for what are recognized as the macro machine instructions.

RISC concepts began a decade after the advent of the IBM 360, during experiments involving demand paging and virtual memory. The effectiveness of address translation logic and main memory sizing is probabilistic. That is, virtual memory relies on a probability that if an area of memory was accessed once, it will be accessed again. The only way to estimate that probability is by experimentation and measurement.

One experiment involved looking at an instruction trace of a compiler execution on an IBM 370. As part of the analysis, the researchers categorized instruction execution by type, ranked by both execution frequency and time of execution. The surprising fact that emerged was that, of the 300 plus instructions on the IBM 370, three simple instruction types were responsible for 80 percent of the workload! These instruction types include memory-to-register loads, register-to-memory stores and transfer-of-control branches.

The instruction mix findings contradicted the basis of the complex instruction set in two ways. First, a large cost component of the system was in the creation of a large instruction set that was not fully utilized. Second, the three instructions that occupied most of the time were simple rather than complex. A direct, hardwired implementation of those instructions would be faster than a microcoded interpreter approach.

HP Labs conducted further research on instruction mixes. *Figure 1* shows a set of experiments conducted on an Amdahl 470, a system with an IBM 370 instruction set. With the exception of floating point operations, the 80 percent mix applies across both commercial and scientific applications. We conducted a similar set of experiments on the HP 3000, finding similar results.

The basic premise of RISC is to create a set of simple, hardwired instructions and simulate the complex instructions with a stream of simple instructions. The hope, of course, is that simulation of the complex instructions will not adversely affect the mix.

Another of the surprises in CISC analysis is that in many cases the complex instruction microprogrammed instructions take longer to execute than their simpler instruction stream counterparts. For example, the IBM 370 instruction to store multiple registers actually would execute faster as a series of store instructions when four or fewer registers were stored. This is true 40 percent of the time.

An even greater example of instruction inefficiency involves the character movement instructions on the IBM 370. The advantage in this class of instructions is movement of a large amount of data in a single instruction. The tradeoff is setup time for an instruction (i.e., analyzing whether the source and destination operands start and stop are word boundaries, whether the operands overlap, and so forth).

In our measurements we found that most of the time the actual character transfer count was very small, making the tradeoff a bad one. *Figure 2* shows the results for short move

FIGURE 1

Instruction	COBOL	FORTRAN	PASCAL
Branch	*15.3%*	*21.4%*	*18.4%*
Logical Operations	*5.6*	*4.3*	*9.9*
Load/Store	*15.5*	*32.7*	*54.0*
Storage-Storage Move	*52.4*	*3.0*	*3.8*
Integer Math	2.3	9.3	7.0
Floating Point Math	0.0	27.4	6.8
Decimal Math	5.9	0.0	0.0
Other	3.0	1.9	0.1

Distribution of IBM 370 instructions by time.

operations. Very similar results were found for long move operations. A series of load and store operations would be more efficient for nearly all cases.

A simpler instruction series can be more efficient than a complex instruction alternative when intelligence can be moved to compile time, rather than microcode execution time. Decisions such as how many registers are to be stored or whether the operands are word aligned can be made prior to execution. The end result is that substituting simple instruction streams for complex instructions does not adversely affect the instruction mix observed in *Figure 1*.

The final motivating RISC factor was the advent of cache memory, specifically instruction set caches. The advent of cache made it possible to fetch an instruction in a single cycle. This made it possible to execute macro machine instructions at the same rate as microcode instructions.

Out of this research came the basics of RISC: Implement a set of simple instructions directly in hardware and use compiler intelligence to produce the optimal instruction path.

A not widely publicized research effort at IBM is credited with the first RISC designs. In 1975, that project produced a computer known as the IBM 801. That system had a performance of 10 MIPS, which was quite surprising considering that the high-end mainframe of the time, the IBM 370/168, had a performance of 2.4 MIPS. And the system under development, the IBM 3033, was projected to have a performance of 5 MIPS. By any scaling of technology, a prototype system of that speed was hard to overlook.

The next step in development was a project at the University of California at Berkeley, which produced a computer called RISC I. Three factors were significant about that development. First, the results were published to the outside world. The Berkeley project essentially defined the RISC architecture. Second, Patterson and his group of students managed to create their working prototype in two academic quarters, a significant step forward in engineering productivity. And third, RISC I was a single chip implementation.

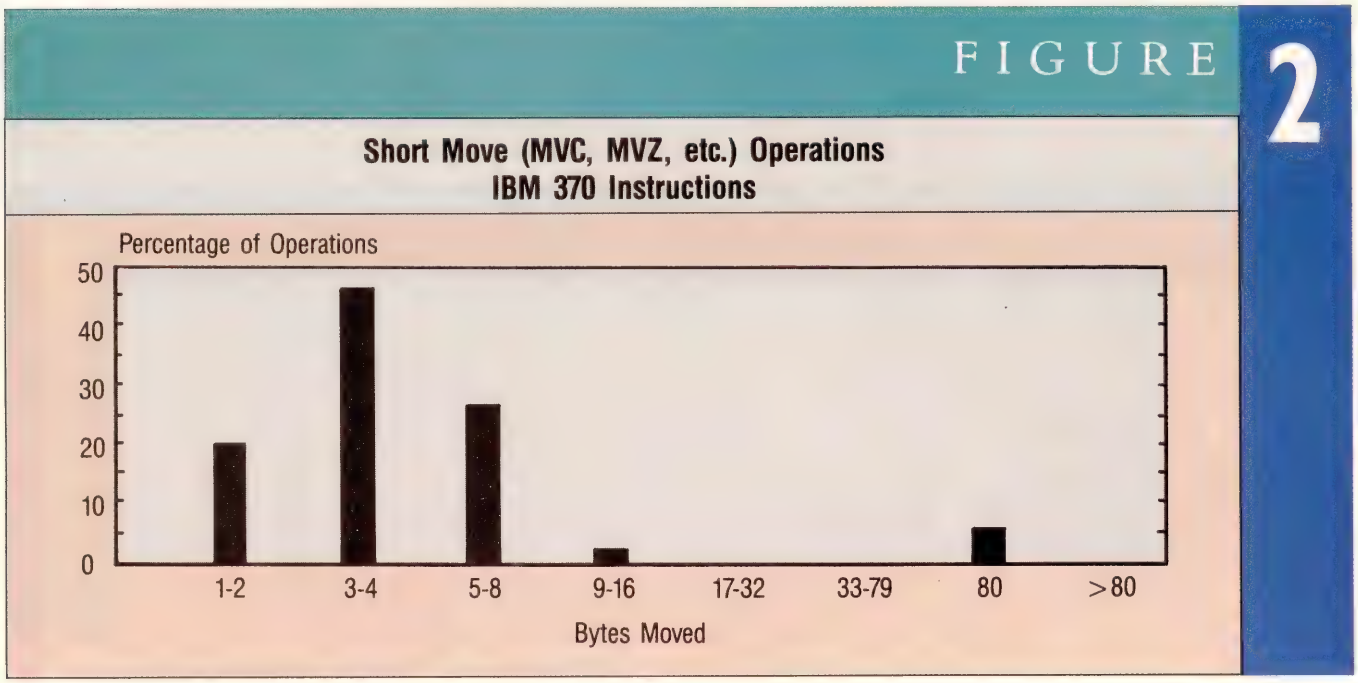
The fact that a RISC implementation requires fewer circuits means that more of the system can be packed into fewer components. The benefits include cost, reliability and speed. Cost and reliability simply are a matter of fewer components. The performance benefits result from being able to execute more functions on-chip. The Berkeley system, for example, put a large register file on the chip to avoid memory accesses. Other implementations might include virtual address translation logic on the same processor chip and perhaps even an on-chip memory cache.

THE ORIGINAL BERKELEY SYSTEM contained 31 instructions, hence the "reduced" adjective as part of the RISC acronym. RISC has evolved since then such that a small number of instructions is not necessarily part of the definition, but rather instructions that are simple in nature are certainly part of the definition.

A simple definition of RISC is that all instructions fall into one of the following two categories:

■ *Register-to-register instructions. These instructions can be of any functional type, including arithmetic, character or bit manipulation,*

FIGURE 2



What HP, Independent Consultants And Users Are Saying About Memory Usage And HPPA

"HPPA Performance is intended to scale directly with respect to processor speed, main memory availability, and workload."
- HP Journal
December 1987

"This (HPPA) architecture uses memory a lot more than (classic) MPE machines. You just replace K (for kilobyte) with M (for megabyte). A lot of customers can easily make use of 128 MB on the system."
"Buy enough memory... The amount of system memory has a direct and dramatic impact on the Series 950's performance."
-Bill Gates
MIS Director, Long's Drugs
The HP Chronicle, March 1988

"Unlike earlier operating systems, both MPE/XL and HP-UX can take advantage of large amounts of memory. Even at 128 MB and beyond, rather than reach a peak, performance continues to improve."
- Steve Cooper
Co-Author of Beyond RISC

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or comparison, but they must execute in a single processor cycle.

■ *Single word memory access instructions. Access to memory is always performed between a register to or from a single word of memory. This includes load and store instructions, but does not exclude more manipulative instructions such as load byte.*

RISC implementations have a set of performance goals. These are goals in the sense that achieving them results in the optimum performance. These goals are:

■ *Execute an instruction every cycle.*

■ *Optimize the instruction set to keep the cycle time short while still maintaining sufficient functionality.*

Current RISC implementations use a variety of features to achieve these goals. RISC uses a pipeline to optimize the instruction execution rate, register load/store scheduling to minimize pipeline interlocks, a large number of registers to minimize the number of memory accesses, delayed branch execution to maximize the efficiency of branch instructions, and instruction primitives to keep the cycle time short, but still allow the execution of more complex operations.

ALL CURRENT RISC IMPLEMENTATIONS, and actually most high-performance computer systems, use a technique called pipelining to achieve speed. The concept behind pipelining is that an instruction can be broken into multiple stages with each stage being processed by an independent piece of logic.

In the HP 3000 Series 930 implementation, the three stages are instruction fetch and decode, execution and an optional memory access. Since these three stages operate independently, they all can operate concurrently. This allows multiple instructions to execute in parallel. In the case of the HP 3000 Series 930, three instructions execute concurrently. A diagram of this operation is shown in *Figure 3*.

The difference between the RISC pipeline and conventional CISC pipelines is that it becomes possible to keep all stages of the pipe constantly busy. That is, it becomes possible to execute an instruction per cycle, or at least approach that rate. The reason is that all instructions contain the same number of equal length stages. This is contrasted against a CISC where a single-cycle instruction fetch might be overlapped against a multiple-cycle execution.

In all pipeline logic there must be some interlock logic to prevent conflicting instructions from executing concurrently. For example, if one instruction loads a register while the next instruction uses the results for arithmetic, a pipeline interlock must take place to prevent the arithmetic instruction from executing before the load is complete. In a RISC implementation the interlock mechanism is simplified by associating a lock with each register. This is contrasted against a complex CISC interlock where any two complex memory reference instructions can conflict.

It should be obvious that in conventional manual assembly language coding a reasonably large number of interlocks will occur. Use of a register is nearly always immediately preceded by a register load in conventional coding.

The solution to this problem is to separate the register access from the use of the register. This technique is known as register scheduling (see *Figure 4*).

In this example, the load of register four is moved two instructions prior so that it overlaps with a non-conflicting, register-to-register instruction. By the time the use of register four occurs, the register already should have been loaded. Effective scheduling should minimize pipeline interlocks due to load and store operations.

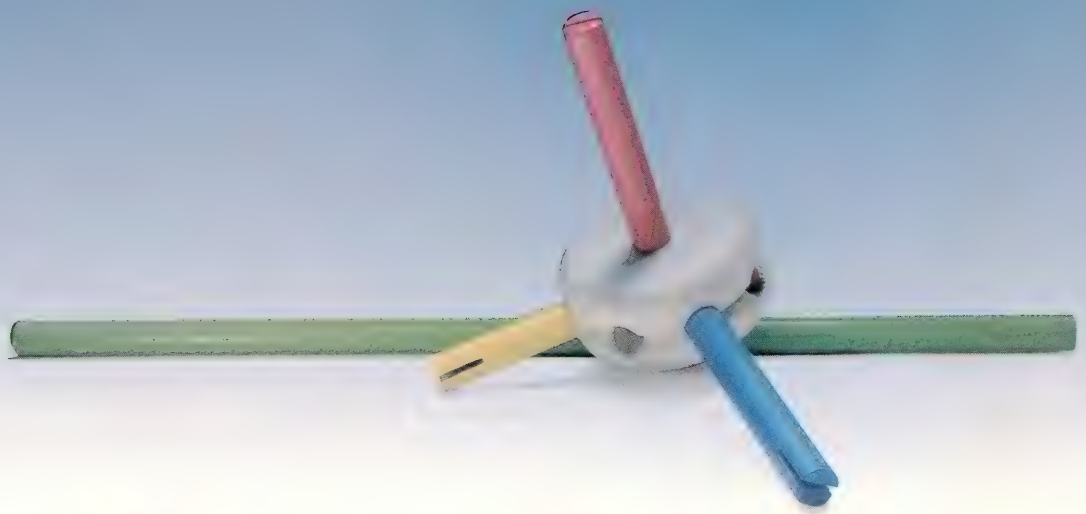
Manual assembly language coding in this fashion is difficult at best. This type of optimization is best done by compilers. A somewhat early implementation at Stanford experimented with leaving the entire pipeline interlock up to the compiler. That is, all conflicts would be resolved at compile time. The compiler would insert extra instructions when it predicted a conflict. This mechanism allowed the building of a processor with even simpler logic.

The HP Precision Architecture system is implemented with a hardware register interlock. Scheduling is left as an optimization stage of the compiler code generator. The obvious advantage of this technique is that optimization is optional. But a second issue is that in contrast to the Stanford implementation, the speed of a memory fetch now can be variable. Specifically, a memory access that hits cache memory, the standard case, happens in one cycle and requires an instruction separation of one cycle. The occasional access that misses the cache can take longer than one cycle.

AN UNFORTUNATE FACT of the original measurements on instruction mixes showed that half of the time was consumed in memory accesses. All RISC implementations attempt to decrease the number of memory accesses by increasing the number of registers. Thirty-two registers seems to be the agreed upon number that decreases the number of times a register must be redundantly loaded, but also minimizes the penalty due to storing and restoring registers on procedure calls. The number 32 is an increase from conventional implementations of eight and 16 registers.

As the number of registers increases, so does the time to save registers during procedure entry. The Berkeley RISC I project addressed this problem by implementing what it called register windows (see *Figure 5*).

In the RISC I implementation, a sliding window of 32 registers is assigned to a procedure. Arguments passed to a procedure are passed via the low order registers. Arguments to the called procedure are passed in high order registers. The mid-range registers are working registers for the executing procedure. As one procedure calls another, the window of working registers slides forward so the caller arguments become the callee arguments. A small set of registers at the base of the register set is always shared.



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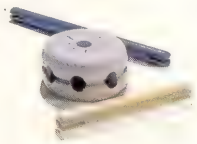

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CIRCLE 241 ON READER CARD

The benefit of the RISC I approach is that procedure calling is optimized with respect to register saving and restoring. This offsets the penalty of increasing the working register count. The disadvantage of the RISC I approach is the larger amount of circuitry required to implement the register set. The HP Precision Architecture implementation, for example, opted for reduced processor logic rather than register windowing.

THE ORIGINAL INSTRUCTION MIX measurements also showed that nearly a third of the time was consumed in executing branch instructions. Conventional branch instructions have a particularly bad effect on the pipeline. Specifically, the next instruction already has been fetched and perhaps decoded by the time the branch instruction is recognized. Yet the execution of the branch instruction will change the instruction counter to some place other than the next instruction in the pipeline. In effect, a conventional branch instruction nullifies the pipeline.

The RISC solution is called delayed branching. In this approach, the instruction after the branch does execute, in spite of the branch. To achieve optimal performance, the compiler rearranges instructions so that one of the prior instructions is moved to the instruction following the branch (see *Figure 6*).

As with load/store scheduling, this type of coding is not natural to the assembly language programmer, but it easily is implemented in a compiler.

The delayed branch technique eliminates wasted instruction fetches due to branch instructions. Delayed branch, together with load/store scheduling, keeps the pipeline constantly busy.

A GOAL OF AN EFFICIENT RISC instruction set is to create simple enough instructions so that the execution phase of an instruction is short, but powerful

FIGURE 3

Pipeline Operation

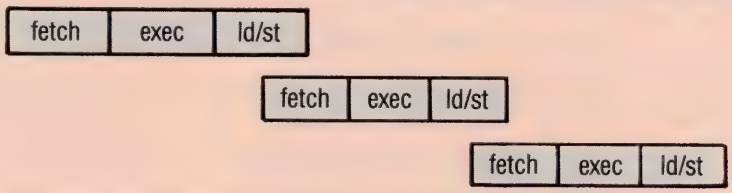
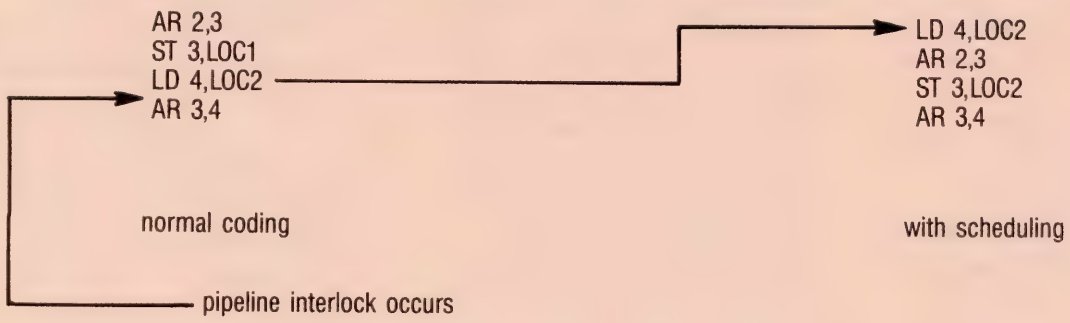


FIGURE 4

Keeping the Pipe Busy: Scheduled Load/Stores



enough so that non-simple tasks do not require excessive execution time by overly simple instructions.

One interesting example is the multiply mechanism. A multiply operation can be simulated by a series of additions. This, of course, is time consuming. An alternative is to have a multiply instruction. Because a multiplier takes longer than an adder, the clock cycle must be elongated. Effectively, in exchange for fast multiply operations, the simpler operations run slower.

The choice made by the HP Precision Architecture group was to implement a primitive that could be used in place of most multiply operations. Their observation was that most multiplications are performed with one of the operands being a small range constant. In fact, over 95 percent of their observations showed that the small operand was less than 1023.

Based on that fact, they mixed a shift and an add operation together, which allows single cycle multiplication by constant values of three, five or nine, or any power of two. By combining a series of these instructions, multiplications by constants of less than 1,023 can be performed in five instructions or less. Multiplication of larger values or unknown register contents can be made in 20 cycles or less.

This type of compromise allows both short instruction execution cycles and power within an instruction set. Similar types of optimizations were made in the HP Precision Architecture instruction set for division and decimal arithmetic.

RISC Today And Tomorrow

THE RISC PRODUCTS of today are significantly more general and perhaps more practical than the pioneering RISC developments. The early RISC I implementation contained 31 instruction types while the HP Precision Architecture implementation contains 140 instructions. The additional instructions increase the instruction set power while still conforming to the RISC specifications.

The HP Precision Architecture implementation deviated

FIGURE 5

Reducing Memory Accesses: Register Windows

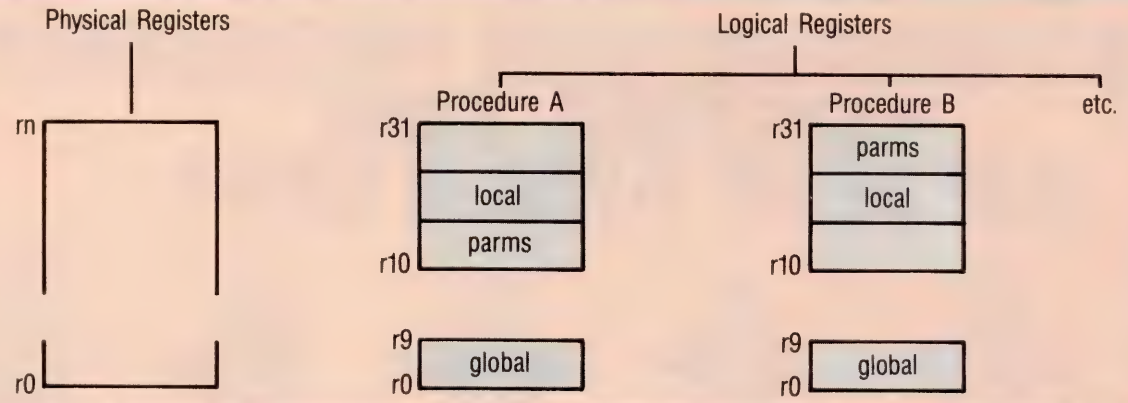
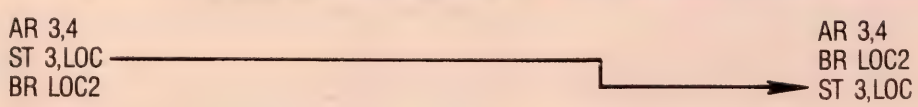


FIGURE 6

Keeping the Pipeline Busy: Delayed Branch



from RISC principles by the addition of a floating point coprocessor. The addition of a coprocessor was a practicality. It allows the system to address a measured performance need without disturbing the RISC principles of the main processor logic.

What is characteristically different about RISC design is the emphasis on measurement. All RISC implementations are based on optimizing the system based on actual use. As should be expected, the end products of RISC live up to the calculated performance.

The end products of RISC architecture within Hewlett-Packard are the HP 3000 Series 900 and HP 9000 Series 800 computer families. A side effect of RISC architecture is that the instruction set is not tailored to an application. That is, the instruction set is inherently generalized. This allows use of the same processor for both commercial and scientific applications.

These products enjoy price performance ratios that are significantly better than their competition on conventional CISC architectures. The HP 3000 Series 935 probably best characterizes the comparison. It has a MIPS rating of 6.0 and a list price of $150,000. This is less than a third of the cost of systems of comparable performance in the industry. Furthermore, a system complete with disc and tape drives fits into a cabinet that is not much larger than a four-drawer file cabinet.

Current implementations of RISC architecture have significant future growth potential. There is still room for significant increases in performance using NMOS technology. Likewise, there are still ECL implementations to come. Single-processor performance improvements are possible for years into the future using conventional technologies and multiprocessor implementations.

What is probably a larger question is, what will happen to the currently successful CISC systems? There is an obviously large investment in the hardware and software of the current systems, but it is probably a matter of time until competitive pressures move the market into RISC. *—Larry Kemp is a systems consultant at Hewlett-Packard, Bellevue, Washington.*

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CIRCLE 143 ON READER CARD

The Promise Of MPE/XL Part I

Learning Its Strengths And Weaknesses And How To Work Around Some Of Those Weaknesses

In 1983, I wrote a paper called "MPE Programming" (presented at the Interex Montreal conference), which showed how you could do some remarkable things with MPE alone, without the aid of a custom-written program. MPE programming was the art of writing system programs entirely in the "language" of CI commands (possibly with some help from standard, HP-supplied utilities).

The main advantages of MPE programming were ease of writing and ease of maintenance. The idea was that a couple of dozen MPE commands in a job stream were easier to deal with than a custom-made SPL or COBOL program, especially since, when you write a program, you'll always have to keep track not just of the job stream, but also the program's source and object files.

UNIX, incidentally, has a very powerful "Command Interpreter Programming" facility (such programs are called "shell scripts"); UNIX users often write many shell scripts to do things that otherwise would require some rather cumbersome C or PASCAL system programs.

Unfortunately, MPE/V (and earlier MPE versions) were not really designed for any sort of sophisticated MPE programming. Many of the tricks I showed in my original paper bordered, I must admit, on the perverse. For instance, to find out if you're in job mode or session mode (without writing a program that calls WHO), I suggested you execute the :RESUME command.

Why the :RESUME command, of all things? Well (almost by accident), the :RESUME command returns one error condition if done in a job and another if done in a session (but not in break). We then could ignore completely the actual function of the :RESUME command and look only at its "side effect" — the value of the CIERROR JCW, which told us whether we were in a job or session.

Similarly, to see if a file existed, we'd do a :LISTF ;$NULL of it. This was not because we wanted to see information about this file (if we did, we wouldn't put on the ;$NULL). Rather, we wanted to see if the :LISTF succeeded or failed. If it failed with a CIERROR 907, this meant that the file didn't exist; if it succeeded, the file did exist.

MPE/XL was intended to make many of these things a lot simpler to do. Instead of weird, indirect techniques, mechanisms would be provided for easily getting environment information (your logon mode, etc.), file information (does a file exist?) and so on. Seemingly, using UNIX as a prototype (in spirit if not always in detail), MPE/XL sought to make MPE programming a straightforward proposition.

To a large extent, Hewlett-Packard succeeded. MPE/XL has a number of new commands and features that let you do much more powerful things from the Command Interpreter. In some ways, though, some of the features seem at first glance to be more powerful than they really are, and quite a few things that you'd like to do remain tantalizingly out of your reach.

In the process of converting my *MPEX/3000* and *SECURITY/3000* products to MPE/XL — and in the process of implementing most of the MPE/XL user interface features in the MPE/V version of *MPEX* (and in *SECURITY/3000*'s STREAMX module), usable by

[By Eugene Volokh]

"classic HP 3000" users — I learned a good deal about the new MPE/XL features, their strengths and their weaknesses, and I'll share them with you here and in upcoming issues.

The New Features Of MPE/XL

THERE ARE SEVERAL NEW MPE programming-related features of MPE/XL. First, MPE/XL supports VARIABLES. Think of them as JCWs that can have string values as well as integer values. (Actually, they can have boolean and 32-bit integer values, too.) For example:

```
:SETVAR FNAME "FOO.DATA.PROD"
```

MPE/XL predefines some variables to values such as your user name, your account name, your capabilities, etc.; for example:

```
:SHOWVAR @
HPACCOUNT = VESOFT
HPDATEF = TUE, FEB 9, 1988
HPGROUP = DEV
HPINPRI = 8
HPINTERACTIVE = TRUE
HPJOBCOUNT = 2
HPJOBLIMIT = 2
HPJOBFENCE = 7
HPJOBNAME = EUGENE
HPJOBNUM = 268
HPJOBTYPE = S
HPLDEVIN = 20
...
```

MPE/XL lets you SUBSTITUTE the values of variables (and even EXPRESSIONS involving the variables) into MPE commands — just as you always could substitute the values of UDC parameters; for example:

```
:SETVAR FNAME "FOO.DATA.PROD"
:PURGE !FNAME
```

is equivalent to:

```
:PURGE FOO.DATA.PROD
```

Then you also could say:

```
:BUILD !FNAME;DISC=![100*NUMUSERS+25];REC=-64,,F,ASCII
```

to build a new FOO.DATA.PROD file with room for 100*NUMUSERS+25 records (presumably NUMUSERS is an integer variable previously set with a :SETVAR).

As shown in the above example, MPE/XL lets you use EXPRESSIONS during variable substitution in the :SETVAR command, :IF command, and the new :WHILE and :CALC commands. A few examples are:

```
:SETVAR EXPECTEDFLIMIT 100*NUMUSERS+25
:SETVAR FNAME "S"+MODULENAME+".PUB.SYS"
:SETVAR MODULENAME STR(FNAME,2,POS(".",FNAME)-2)
:IF HPACCOUNT<>"SYS" THEN
:IF POS("SM",HPUSERCAPF)=0 THEN
  << user doesn't have SM >>
```

As you can see, the expressions can involve either numbers or strings, and a number of useful string operators have been defined, such as:

- *+ to concatenate strings,*
- *STR to extract substrings,*
- *POS to find the position of one string in another,*
- *UPS to upshift a string*

and many others.

Perhaps the most useful of the defined operators is FINFO, which takes a filename and an option number and returns a piece of information about that file:

```
FINFO(filename,0) = TRUE if file exists, FALSE if it doesn't
FINFO(filename,1) = string with fully-qualified filename
FINFO(filename,4) = string containing file's creator
FINFO(filename,8) = file's creation date, formatted string
FINFO(filename,-8) = file's creation date, integer format
FINFO(filename,9) = file's string filecode (e.g., "EDTCT")
FINFO(filename,-9) = file's integer filecode (e.g., 1052) and
much more.
```

For example, to check if a file exists, you can type:

```
:IF FINFO('MYFILE',0) THEN
```

To check if a file is more than 90 percent full, you might enter:

```
:IF FINFO('MYFILE',19)>=FINFO('MYFILE',12)*9/10 THEN
```

FINFO mode 19 gets you the EOF; FINFO mode 12 gets you the FLIMIT. (The mode numbers are taken from the FLABELINFO intrinsic. One of the weaknesses of FINFO is that you have to remember these silly item numbers.)

Commands have been added to OUTPUT and INPUT data:

```
:ECHO NOW WE'LL ASK YOU FOR A FILENAME.
```

```
:INPUT FNAME; PROMPT="Please enter the filename:"
:ECHO FNAME = !FNAME, FLIMIT = ![FINFO(FNAME,12)]
```

The :INPUT command even can have a timeout (wait for no more than X seconds) option.

In addition to MPE/V control structures like :IF, :ELSE and :ENDIF, MPE/XL implements the :WHILE / :ENDWHILE construct; for example:

```
:SETJCW I = 295
:WHILE I < 314
: ABORTJOB #J!I
: SETJCW I = I+1
:ENDWHILE
```

Instead of setting up UDCs, you can set up COMMAND FILES. If you want to define a command called S that does a :SHOWJOB, you can build a file called S.PUB.SYS that contains the lines:

```
PARM WHAT=" "
SHOWJOB JOB=@!WHAT
```

Now, whenever you type :S J, for example, MPE/XL will execute the fil S.PUB.SYS passing "J" to it as a parameter; same as a UDC, but no need to :SETCATALOG.

Actually, whenever you type a command (like S in the example above) that isn't a normal MPE command, MPE/XL doesn't just check for it in PUB.SYS. Instead, it looks at the variable (remember those?) called HPPATH and tries to find the file in the groups listed in the variable.

By default, HPPATH is set to:

```
!HPGROUP,PUB,PUB.SYS
```

This means, "first look in !HPGROUP (i.e., your group), then in the PUB group (of your own account) and then in PUB.SYS." You can change HPPATH to tell MPE/XL to look in UTIL.SYS, PUB.VESOFT, PUB.TELESUP, etc. Note that UDCs and built-in MPE commands take precedence — the HPPATH groups are searched only if the command you typed isn't a UDC or a built-in MPE command.

In addition to letting you execute command files by just entering their names, you also can run a program just by entering its name (IMPLIED RUN). If you say :SPOOK, MPE/XL will search the groups specified in HPPATH. If the first file it finds is SPOOK.PUB.SYS (a program file), it'll run it just as if you'd said:

```
:RUN SPOOK.PUB.SYS
```

Similarly, to run a program in your own group, you can say :MYPROG and MPE/XL automatically will supply the :RUN (remember, MPE/XL will look in HPPATH to determine which groups it should search — by default, your group is one of them). If you say:

```
:MYPROG "BANANA",5
```

it'll run MYPROG with INFO="BANANA" and PARM=5 (other :RUN command parameters are not available). The quotes around BANANA can be omitted, but only if the INFO= string doesn't include commas, semicolons, equal signs or blanks!

Finally, a few odds and ends:

- *The :CALC command works as a general-purpose integer and string calculator.*
- *The :RETURN command lets you easily exit a UDC or a command file.*
- *Users now can redefine their own prompt by setting the HPPROMPT variable.*
- *:SETCATALOG lets you add a new UDC file (or remove one) without retyping the names of all the other UDC files (which is cumbersome and risks accidentally unsetting an important file).*
- *You can :REDO not just the last command, but one of the last 20 commands (or even more than 20 if you so choose). This actually is a very powerful tool — I'm only including it in "odds and ends" because it's not directly relevant to MPE/XL programming.*

The Benefits Of MPE/XL

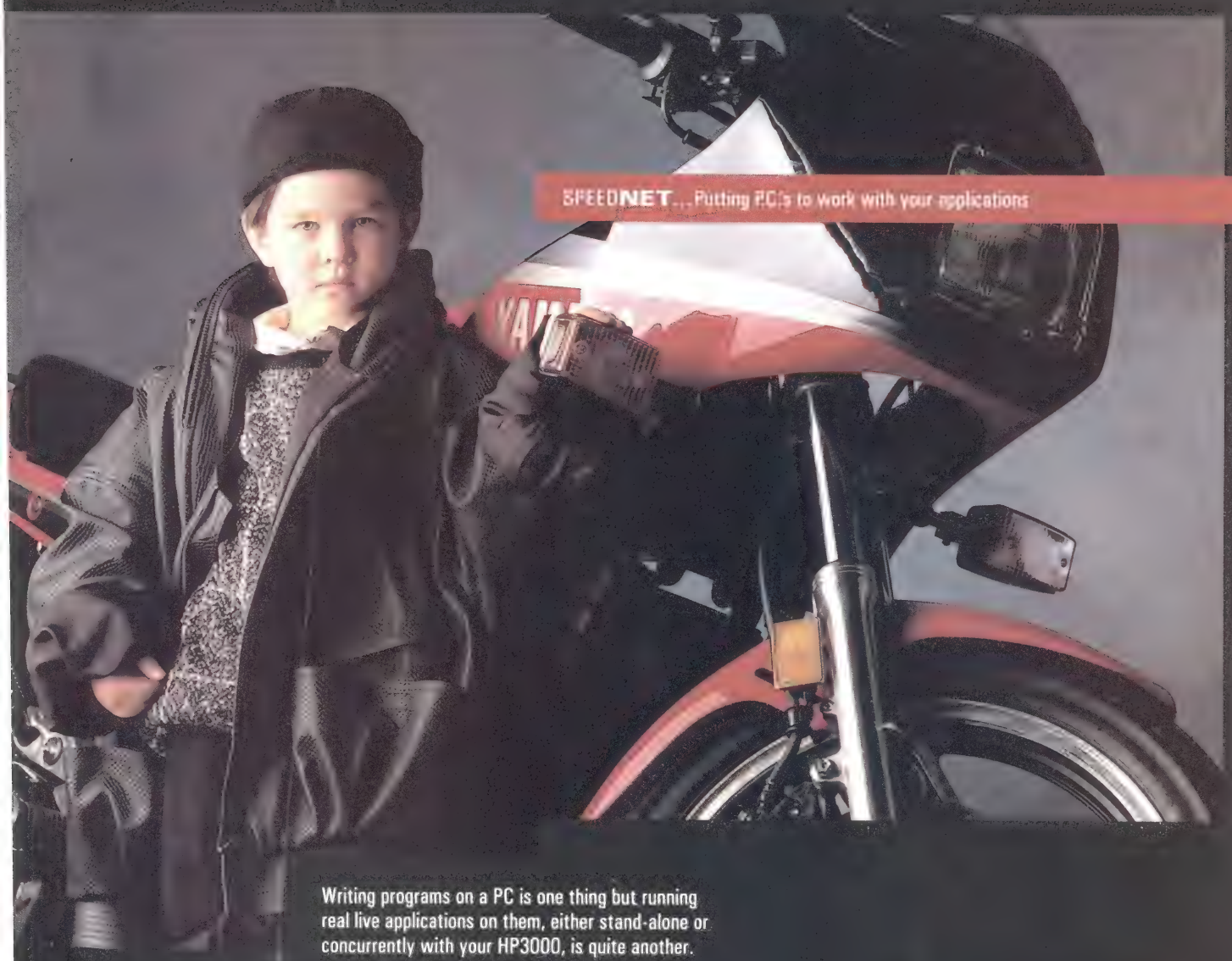
ONE EXAMPLE IN MY original "MPE Programming" paper involved a UDC finding out whether it's being executed in a session or in a job. This might, for instance, be a logon UDC that you use to set your function keys — it outputs a whole bunch of escape sequences, which you want to see when you're online, but which only will garble your printout if printed in a job.

In MPE/V, if you recall, checking job/session mode was done this way:

```
SOFTKEYSINIT << the logon UDC name >>
OPTION LOGON
SETJCW CIERROR=0
CONTINUE
RESUME
IF CIERROR< >978 THEN
  << initialize the softkeys >>
ENDIF
```

Very straightforward, isn't it? The :RESUME command, of course, is not used for :RESUMEing at all; rather, we count on it to generate an error condition — error 978 if in batch, but a different error (warning 1686) if online.

Small can be powerful



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MPE/XL makes this laughably simple:

```
SOFTKEYSINIT
OPTION LOGON
IF HPINTERACTIVE THEN
  < < initialize the softkeys > >
ENDIF
```

Essentially, MPE/XL automatically presets some variables to interesting values — HPINTERACTIVE, HPLDEVIN (your terminal number), HPUSER (your logon user id), etc. This process actually started in MPE/V with the HPYEAR, HPMONTH, HPDATE, HPDAY, HPHOUR and HPMINUTE JCWs, but MPE/XL has added a lot of new and useful ones.

Some additional practical applications are readily apparent and others (the best kind) aren't. For instance, a really nice typing-saver is:

```
:NEWUSER JACK;CAP = !HPUSERCAPF
```

"HPUSERCAPF" stands for "USER CAPabilities, Formatted." It's a STRING variable that indicates which capabilities you currently have; e.g., "AM,AL,GL,ND,SF,PH,DS,IA,BA". The "!" before the "HPUSERCAPF" works much as it would before a UDC parameter: It tells MPE to substitute the VALUE of the HPUSERCAPF variable in place of its name.

Thus, the command might end up being:

```
:NEWUSER JACK;CAP = AM,AL,GL,ND,SF,PH,DS,IA,BA
```

You didn't have to type in all of those capabilities. The !HPUSERCAPF automatically put in all the ones you have. You might even say:

```
:NEWUSER JACK;CAP = ![HPUSERCAPF-"AM,"]
```

Entering ![xxx] tells MPE, "Evaluate the expression xxx and substitute its result." Subtracting two strings in MPE/XL removes the first occurrence of the second string from the first. Thus, the :NEWUSER command becomes:

```
:NEWUSER JACK;CAP = AL,GL,ND,SF,PH,DS,IA,BA
```

since "AM,AL,GL,ND,SF,PH,DS,IA,BA"-"AM," is:

```
"AL,GL,...,BA".
```

Another nice example is:

```
:FILE SYSLIST=BK!HPYEAR!HPMONTH!HPDATE,NEW;DEV
  =DISC;SAVE
:STORE @.@.@; *T
```

This will do a system backup and send the listing to a disc file *identified by the backup date*. Thus, you can keep many of your backup listings online (so you easily can tell which tape set and reel number a file was on); each one will be stored in its own file. For instance, on November 20, 1988, the above commands will be executed as:

```
:FILE SYSLIST=BK881120,NEW;DEV=DISC;SAVE
:STORE @.@.@; *T
```

Unfortunately, it's not quite this simple. What if we do the :FILE SYSLIST= on January 21? Then, we'd get:

```
:FILE SYSLIST=BK88121;...
```

— not quite what we want, since it easily could stand for December 1.

We'd like the month and day to be zero-padded so the file names will be more comprehensible and a :LISTF will show them in the right order (i.e., not show BK88121 after BK881105). Try this example:

```
:FILE SYSLIST=BK![10000*HPYEAR+100*HPMONTH+HPDATE];...
```

Instead of substituting the month and the day directly, we calculate the value 10000*HPYEAR+100*HPMONTH+HPDATE. Since this is arithmetic, not textual substitution, "zero-padding" will occur. January 21, 1988, will yield 880121; April 9, 1988, will yield 880409. Then we textually substitute the resulting value into the :FILE equation:

```
:FILE SYSLIST=BK880121;...
```

Even the additional power of MPE/XL doesn't remove the need for a little ingenuity.

Finally, one more useful UDC:

```
HIPRI JOBNUM
ALTJOB #J!JOBNUM;INPRI=14
SETVAR OLDJOBLIMIT HPJOBLIMIT
LIMIT ![HPJOBCOUNT+1]
LIMIT !OLDJOBLIMIT
DELETEVAR OLDJOBLIMIT
```

When you :STREAM a job and find it at the bottom of the WAIT queue, you want it to execute, but you don't want to let any of the other WAITing jobs through. This UDC:

- *Alters the job to input priority 14 (the highest priority possible).*
- *Saves the old job limit (indicated by the built-in variable HPJOBLIMIT) in an MPE/XL variable (OLDJOBLIMIT).*

- *Sets the job limit to HPJOBCOUNT — the number of currently executing jobs — plus 1, letting the topmost WAITing job (the one you just :ALTJOBed) through.*
- *Sets the job limit back to what it was before.*
- *Just for cleanliness, deletes the OLDJOBLIMIT variable.*

The one problem I can see is that the UDC expects only a job NUMBER, not the leading "#J". If a user types:

```
HIPRI #J123
```

then the first line will be:

```
ALTJOB #J#J123;INPRI=14
```

MPE won't like this much. We'd like to let the user type either:

```
HIPRI 123
```

or:

```
HIPRI #J123
```

whichever he prefers.

The solution is again fairly simple, taking advantage of MPE/XL's provisions for strings and string operators:

```
HIPRI JOBNUM
IF UPS(LFT("!JOBNUM",2))="#J" THEN
  ALTJOB !JOBNUM;INPRI=14
ELSE
  ALTJOB #J!JOBNUM;INPRI=14
ENDIF
SETVAR OLDJOBLIMIT HPJOBLIMIT
LIMIT ![HPJOBCOUNT+1]
LIMIT !OLDJOBLIMIT
DELETEVAR OLDJOBLIMIT
```

The key here is the :IF expression. It extracts the leftmost two characters of the string containing JOBNUM (LFT ("!JOBNUM",2)), upshifts them (UPS(LFT("!JOBNUM",2))) and then compares them against "#J". If the characters are equal to "#J", then we just do an :ALTJOB !JOBNUM. If the characters are something else (presumably the start of the job number), then we insert a #J in front of them.

Obtaining File Information

ONE OF THE MOST VALUABLE new features of the MPE/XL CI is the ability to obtain file information. Remember the old MPE trick of finding out if a file exists or not?

```
SETJCW CIERROR=0
CONTINUE
LISTF MYFILE;$NULL
IF CIERROR=907 THEN
  << file doesn't exist >>
ELSE
  << file exists >>
ENDIF
```

Again, what we're doing here is executing a command (:LISTF) not for its main purpose, but rather for a side effect. If we give :LISTF a file that doesn't exist, it'll set the CIERROR JCW to 907; if the file exists, CIERROR will remain 0.

MPE/XL is much more straightforward:

```
IF FINFO('MYFILE',0) THEN
  << file exists >>
ELSE
  << file doesn't exist >>
ENDIF
```

The FINFO function returns information about the file whose name is passed as the first parameter. The second parameter tells FINFO which information is to be returned; zero means a TRUE/FALSE flag indicating whether or not the file exists. Other values ask for other things, such as file code, EOF, FLIMIT, etc.

Applications for this abound. For instance, your job stream might rename a file while preserving its lockword:

```
:RENAME OLDFILE/![FINFO('OLDFILE',33)],NEWFILE/![FINFO
 ('OLDFILE',33)]
```

Similarly, a command like:

```
:IF FINFO('AP010S',-8)>FINFO('AP010P',-8) OR &
:   FINFO('AP010S',-8)=FINFO('AP010P',-8) AND &
:     FINFO('AP010S',-24)>FINFO('AP010P',-24) THEN
```

would check to see if AP010S was modified after AP010P. If AP010S is the source file and AP010P is the program, you might want to trigger an automatic recompilation. Note how we're comparing FINFO (-8)s (the last modify dates, expressed as YYYYMMDD integers) of the source and the program. If the modify date of the source is greater, the expression yields TRUE. If the modify dates are equal, we then compare FINFO (-24)s (the last modify times, expressed as HHMMSS integers).

At first glance, one of the most powerful applications of FINFO would seem to be something like this:

```
:IF FINFO('DATAFILE',19)>FINFO('DATAFILE',12)-100 THEN
```

```
: TELLOP File DATAFILE is &
:   ![FINFO('DATAFILE',19)*100/FINFO('DATAFILE',12)]% full!
:ELSE
...
```

FINFO(xxx,19) returns xxx's EOF; FINFO(xxx,12) returns xxx's FLIMIT. If EOF > FLIMIT-100, we send a message to the operator indicating how full the file is (again, the wonders of expression substitution).

This would be very useful on an MPE/V system, where file overflows are a real concern; however, on MPE/XL, files can be built with a very high file limit without wasting much disc space. Thus, MPE/XL users rarely need to worry about file EOFs and FLIMITs.

However, we might still want to compare the number of entries in an IMAGE dataset against its capacity; unfortunately, there's no FINFO option that gets us this information.

There are, in fact, two pretty serious problems with FINFO. For one, there are still a number of things that FINFO just doesn't provide. To name a few:

- *The NUMBER OF SECTORS in a file.* I found myself wanting to write a command file that compared the number of sectors a file occupied before and after a certain operation, but there was no way of getting this information.
- *The file's LAST ACCESS DATE/TIME and LAST RESTORE DATE/TIME.* (FINFO gives us the creation date and the last modify date, but not the last access date or the last restore date).
- *The file's security information — :RELEASEd/:SECUREd flag, security matrix, etc.* It would be nice, for example, to check your access rights to a file before running a program that might abort if it isn't given the access it wants.
- *Whether or not the file is currently IN USE (and if it is, in what mode).*
- *The NUMBER OF EXTENTS in a file, the number of user labels and others (IMAGE dataset information, etc.).*

In fact, if you look at the FINFO option numbers, you'll find that they're pretty much a subset of the option numbers of the FLABELINFO intrinsic, which also lets you obtain file information. Why a subset? Why not just implement all the FLABELINFO options (though even that would still leave some options out)?

All the file attributes — certainly all those listable with :LISTF ,2 and MPE/XL's new :LISTF ,3 — should be easily obtainable from the CI.

Perhaps more important than the omitted functions is the fact that all the FINFO options are "magic numbers." When you saw the command:

```
:IF FINFO('DATAFILE',19) > FINFO('DATAFILE',12)-100 THEN
```

was it clear to you what FINFO(xxx,19) and FINFO(xxx,12) did? If HP is going to implement file access functions, why not have an FFLIMIT('DATAFILE'), an FEOF('DATAFILE'), an FFILECODE('DATAFILE') and so on? Or, if you want a single function, let the user enter:

```
FINFO('DATAFILE','FLIMIT')
```

or:

```
FINFO('DATAFILE','EOF')
```

It would take a little bit of extra time to parse, but think of the advantages in clarity.

Of course, you can remedy this problem yourself by setting up (probably in a logon UDC) variables or JCWs that are set to the appropriate FINFO values; for example:

```
SETVAR FIFILECODE 9
SETVAR FIFLIMIT 12
SETVAR FIEOF 19
...
```

You'd probably have to set either 14 or 18 of these variables, and then you could enter:

```
:IF FINFO('AP010S',-FIMODDATE)>FINFO('AP010P',-FIMODDATE) OR &
: FINFO('AP010S',-FIMODDATE)=FINFO('AP010P',-FIMODDATE) AND &
: FINFO('AP010S',-FIMODTIME)>FINFO('AP010P',-FIMODTIME) THEN
```

or:

```
:IF FINFO('DATAFILE',FIEOF)>FINFO('DATAFILE',FIFLIMIT)-100 THEN
```

Unfortunately, most people won't do this — they'll use the "magic numbers" and let you try to figure out what's going on.

Even if you set up all the variables and use them consistently, you'll lose one of the greatest advantages of command files: their standalone nature. Your "MPE programs" now will rely on your logon UDC and its SETVARs. If it gets deleted, they'll stop working. If you want to copy your job stream or other MPE program onto some other machine, you'll have to be sure that the other machine has the same logon UDCs. The point is that HP shouldn't have made you (or let you) use "magic numbers" in the first place.

This might seem like looking a gift horse in the mouth. For 15 years, we had nothing, and now when they give us something, we want more. However, it seems almost a shame that HP, having made the CI so much more powerful, didn't implement such reasonable and useful features.

In Part 2 we'll look at input and output, :WHILE loops, command files, and some fun things you can do with a little bit of trickery. *—Eugene Volokh is president of Vesoft, Los Angeles, California.*

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CIRCLE 160 ON READER CARD

Emerging As The Confident Forerunner

HP Takes High Ground In Workstation War

[BY RICHARD M. VOELKER]

With its April 6, 1988, New York introduction of two new RISC-based Precision Architecture computers, the Model 835S and Model 855S, Hewlett-Packard became the odds-on, high-ground occupant in the ongoing workstation war. According to most reports, HP's $250 million, high-stakes gamble on simplified computer architecture and its strong commitment to UNIX and other industry standards already have competitors scurrying to catch up.

In fact, while many of the other major computer vendors have been preparing for the upcoming fray by forging strategic alliances, HP has emerged as a calm and confident forerunner, secure in the knowledge that it has been preparing for this struggle for more than six years.

Its 9000 family of Precision Architecture Systems now includes, from low- to high-end, Models 825S, 835S, 840, 850S and 855S. Individual machine capabilities span the gamut from the 8/56 MBS and 64-user capacity of the 825S, to the 400-user capability of the Model 855S.

HP now has the right array of workstation products at the right prices, and it has the proven experience and customer service know-how to fully support its technical installations.

Technical workstations have been around for almost a decade, but with today's trend to distribute computer power directly to users rather than share processing time on mainframes or minicomputers, workstations have become the fastest growing and sexiest sector of the CAD/CAM marketplace.

Making high-powered workstations strategically available to the fingertips of key engineers and designers makes good productivity sense, especially when supported by an

underlying PC network. To the domestic manufacturing world, plagued by an inability to compete with offshore suppliers, it also makes product development sense in terms of reduced time lines and shorter design/build cycles.

In addition, these high-performance, 16- and 32-bit computers have become extremely sophisticated. Most are able to display the high-resolution images required for electronic and mechanical design layout functions. They typically have a networking capability that enables data sharing.

Although the definition of workstations is somewhat imprecise today, it's generally agreed that they occupy the middle ground between PCs and the larger minicomputers and mainframe systems. This distinction is becoming increasingly blurred, however, with each technological event — the debut of Intel's 80386 chip, for instance — that makes either PCs more powerful, or minicomputers more compact.

Whatever the definition, the concept of desktop computers with graphic and networking capabilities quickly has been embraced by engineers who now are using workstation computers to design diverse types of electronic circuitry and mechanical parts.

Although Hewlett-Packard invented the first technical workstation, the HP Model 9830, in 1972, and has remained a player in the technical workstation marketplace, most of the initially small needs were met by lesser companies like Sun Microsystems and Apollo Computer, who devoted all their efforts exclusively to this market. As a result, both of these companies had about $500 million sales in 1987. As the potential of this market rapidly expanded to its current estimate of $2 billion, it's attracted the attention of much larger vendors like Digital Equipment Corporation, IBM and others.

As with most computer innovations, workstations originated in the workplace of engineers and scientists. However, analysts are predicting a rapid workstation migration to the business sector with some projecting that, by the early 1990s, 85 percent of the workstation market will involve commercial applications. But even without this expansion into the office and business world, the existing technical workstation potential worldwide is huge.

Dataquest (San Jose, CA) estimates the base of traditional users — scientists, engineers and programmers — to be about eight million persons. Approximately one-half of these users currently have PCs on their desks. The company further predicts that about 2.5 million of these PCs eventually will be replaced by workstations. By early 1988, 163,000 already had been shipped.

So, a very bright future is predicted regardless of what happens in the business sector. Dataquest projects an industrywide annual growth rate in revenues of 30 percent through 1991, by that time reaching annual revenues of about $6.3 billion. No other segment of the computer marketplace is expected to expand this rapidly or significantly.

In light of these predictions, it isn't surprising that most computer vendors now are jockeying for position in the continuing workstation sweepstakes. But no vendor seems to be as strategically positioned as HP.

HP's Edge

HP BEGAN PREPARING for the workstation wars back in 1982 when it first began exploring hardware simplification based on reduced-instruction-set computing (RISC). But it really didn't fire first salvo until 1985, when it became the first major computer vendor to make an across-the-board commitment to a RISC-based architecture. At the time, this was a fairly audacious departure from the computer industry norm of introducing successive generations of incompatible, "standalone" hardware. HP instead designed its Precision Architecture family of computers with a scalable platform that incorporates standards such as UNIX, Ethernet (HP AdvanceNet) and NFS.

These new RISC-based computers evolved out of HP's realization that there was an industrywide need for the simplification of computer architectures. Dan Vivoli, the HP product manager for the Series 800 midrange systems was actively involved in the development of this new architecture. He describes its evolution:

"Back in the early '80s, our researchers took a long look at the existing computer architectures: VAXs, IBMs and other popular hardware. They realized that because of their respective complexities, it wouldn't be very long until all these vendors would run into a "price/performance wall." So they began looking for a simplified platform that would enable HP to push the price/performance curve — hopefully, a long-term standard platform that could last into the next century. That was how RISC began at HP — we quite literally bet our company's future on this one architecture."

It wasn't long before the marketplace proved HP eminently right. Other vendors since have developed RISC-like platforms, particularly the smaller manufacturers who specialize in workstation computers: Sun, Apollo and Silicon Graphics. However, neither Digital nor IBM is known to have made a similar, across-the-board public commitment to a simplified architecture.

"The prevailing design concept used to be, 'The more capability you could build into hardware, the better it was,'" explained Vivoli. "But this eventually led to unnecessarily complex hardware that, because of its complexity, actually ran slower. So the whole idea today is to optimize your design around those computer applications and functions that are used the most. You then end up with a machine that runs faster overall and costs less."

Early results have confirmed this prediction. As recently reported in *Business Week*, Hal Feeney, vice president of Dataquest, estimated that the HP 9000 Model 850S, priced at about

$200,000, will match the performance of DEC's VAX/8650, which costs about $475,000. Precision Architecture is indeed delivering more bang for the buck for HP.

A second strategic difference that favors HP is the compatibility of its Precision Architecture to standards that most users want, particularly UNIX. HP-UX, HP's enhanced version of UNIX System V, with Berkeley 4.2 extensions, has been available since 1983.

Since its 1969 beginnings at AT&T, UNIX has become one of the most widely used operating systems ever developed. In the world of workstations, UNIX has become the de facto operating standard.

There's a widespread momentum towards standardization and particularly the use of UNIX: It's now used in 90 percent of the universities in both the U.S. and Europe (Dataquest 1987); 65 percent of all federal RFPs specify UNIX-based solutions (Gartner Group SCS 9/19/86); and General Motors has asked all vendors to adopt System V UNIX (Yankee Group). It's quite understandable, therefore, that HP's two largest rivals, IBM and Digital Equipment Corporation, have belatedly acknowledged this reality and recently dusted off their moribund versions of UNIX. But, in terms of the workstation market, it may be a case of too little too late.

In addition to RISC architecture and UNIX operating systems, HP's bottom line workstation edge is buttressed by its extensive technical experience and excellent customer support record. HP has been serving the instrumentation and computational needs of engineers and scientists for more than 50 years.

According to Datapro Research (Delran, NJ), HP has been number one in customer support and satisfaction for five consecutive years — an unequalled performance in the industry that's frequently mentioned by new HP customers and value-added resellers.

WHILE THERE'S CONSIDERABLE disagreement as to who is first in the workstation market today, there's little disagreement as to who the major players are. Michael Liebowitz, in a recent article in *High Technology Business*, claims there currently are seven major combatants in the workstation war. In descending order of importance, he lists: Sun Microsystems, Apollo, HP, DEC, IBM, Apple and NEC. But there's definitely a mixture of "apples and oranges" in this listing.

Sun and Apollo both have been exclusively involved in the technical workstation marketplace since its beginning in 1981 when Apollo shipped the first model. Although Leibowitz claims they currently share the market lead, the total

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sales of each company in 1987 was about $500 million. This is considerably less than the $8.1 billion total sales revenue of the number three company, Hewlett-Packard; and the $9.3 billion sales revenues of number four, Digital; or the $54.2 billion sales of number five, IBM. It isn't surprising, therefore, if Sun and Apollo might be somewhat nervous thinking about sharing their workstation "playground" with these industry giants.

In 1986, International Data Corporation (Framingham, MA) ranked HP as being the workstation leader that year with $398 million in sales (approximately 28 percent of the market). Apollo and Sun were listed second and third, with $391 (27.8 percent) and $341 (24.3 percent) million in sales, respectively. This same report ranked DEC a distant fourth with only a 7.3 percent market share and IBM sixth with a 3.4 percent share, or $48 million in workstation sales.

With potential workstation revenues projected to reach $6.3 billion through 1991 (Dataquest 1987), it's not surprising to see most of the computer vendors jockeying to better their market positions. In addition to being fierce, some of this infighting has produced strange bedfellows.

Scrambling For Market Position

NO LONGER CONTENT to just "bang heads" with Apollo, Sun Microsystems recently formed a strategic alliance with AT&T. For 20 percent of Sun's outstanding stock over the next three years, AT&T will work to further improve and standardize UNIX, the operating mainstay of Sun's computers. Other vendors, understandably afraid of the proprietary advantage such improvements might give Sun, have petitioned AT&T also to become participants in this development work.

In March 1987, Apple Computer, anxious to develop a stronger manufacturing image, introduced Macintosh II, a personal computer with enough power to elbow into the low-end workstation market. Shortly afterwards in April, IBM followed with its new souped-up PC, PS/2 Model 80, which also is geared to the needs of low-end workstations. At the beginning of 1988, Apple made another move against IBM: a joint venture agreement with Digital Equipment Corporation to develop products to link both companies' computers. When complete, these new products will enable data-sharing between VAX and Apple hardware and will permit Macintoshes to function as VAX terminals.

Acquisition is one of the known ways to survive in an increasingly competitive CAD/CAM marketplace. So, Prime Computer made a $390 million hostile bid in late 1987 to acquire Computervision, the relatively small pioneer vendor of specialized machines for computer-aided design and manufacturing. Unable to get a higher offer, the company announced its acceptance in January 1988. However, with first-quarter profits after the buyout down by 25 percent, according to a recent *Wall Street Journal* report, early reviews of the marriage are less than idyllic.

With so many competitors taking aim at its vulnerable midrange, IBM vowed at year's end to put more muscle into its midsized product line in 1988. Acknowledging that sales of its "VAX-killer" 9370 minicomputer were less than expected, IBM revealed plans to improve this product. It also has great hopes for its new Silverlake computer, the trade-up replacement for two older IBM midrange machines, the Systems 36 and 38. In recognition of its own inability to properly market midrange machines, IBM also has decided to give more responsibility to outside marketers, a move that would've been considered heresy by Big Blue until recently.

Meanwhile, amidst all this industry scrambling and realignment, HP proceeds confidently along, firmly in control of its own workstation destiny — a destiny described by some in very optimistic terms and totally consistent with its well-planned strategic direction.

Upon introducing its latest RISC-based technical computers (HP 9000 Models 850S, 825S and 825SRX) in the spring of 1987, HP was described by Edmund Spelman, an analyst with Oppenheimer & Company, as a company "on a real roll." He characterized the new Precision Architecture as "setting the standard for a decade of new machines."

Greg Marus, an industry analyst with Dataquest Inc., described HP's new Precision Architecture as being technically impressive and aggressively priced. In addition, he praised the Series 800's networking capabilities and credited its open architecture as enabling these machines to "communicate very well with other vendors."

The Yankee Group claimed HP had "scored a performance coup with the mainframe-level compute power and photo-quality graphics of its 825SRX workstation." It also said the addition of the 825SRX to "HP's broad workstation line foreshadows a continuance of the rapid workstation hardware market penetration the company has enjoyed since it first entered this market in 1985."

Adam Cuhney, an electronics analyst with Kidder Peabody & Company of San Francisco, said the new RISC-based technical machines position HP strongly in high-end scientific workstations — they tell "the world that HP is alive and well and [that] they are going to be extremely competitive with their computers."

A Long-Haul Strategy For Victory

AS IMPORTANT AS INDUSTRY recognition is for its new line of RISC-based computers, HP's strategy for winning the workstation war is far more comprehensive and long-term. As expressed by Tim Haney, a central figure in the Technical Systems Sector who manages HP's

Technical Sales Centers, "RISC technology is just one of many technological skirmishes we had to win to get our total game plan in place. It's an important part of that plan, but certainly not the total plan.

"Back in 1982, HP took a good hard look at where it was going and the issues involved in getting there. Committing to RISC at that time was just part of our long-term strategy. Even though many in the business felt we were taking a chance at the time, we never felt that way.

"From a strategic point of view, HP's objective is to be able to offer everything from soup-to-nuts to the technical workstation user. And if you look at our product line, you'll see that we're pretty close to reaching this objective. In terms of hardware, almost everything's in place: from our low-end Vectra PCs; through our HP 68000-based Series 300 midrange workstations; and now our latest HP 9000 Series 800 computers, which give us very high-end performance with real-time, three-dimensional, solid-type rotational capabilities. So, whatever the specific needs of the customer, we now have a continuum of products to meet all requirements. And we're unique in this regard — no other vendor can offer the same array of hardware and cost/performance capabilities.

"But more important than specific hardware is HP's commitment to industry standards and open systems. Flexibility and openness are two critical elements in our long-term strategy. Customers that buy Series 300 machines today to fit a specific need want to know that they'll be able to increase their capabilities tomorrow without having to change vendors, operating systems, protocol or whatever. So, very shortly, HP will have in place a very smooth, source-code migration capability for porting all 300 applications to the new 800 machines. And to further enhance overall flexibility, we've now made *NewWave*, our user-friendly standard interface, available for all computer models. Users now can bridge and interact with different operations.

"Not too long ago," Haney concluded, "whenever vendors introduced a new product line, sales of existing hardware would plummet until everyone had a chance to push, prod and tweak the new machines. But that's all changed at HP. In fact, because of the flexibility and compatibility between systems, our midrange technical workstation sales have continued at a brisk pace in some pretty heavy-duty engineering environments."

Patricia Seybold, the president and CEO of Office Computing Group of Boston and a well-known expert in such matters, recently was quoted asking: "Who is playing the best

game of capture the flag in microcomputer software? Microsoft, you say? Lotus? Guess again. It's Hewlett-Packard."

She continued, "*NewWave*, Hewlett-Packard's object-oriented windowing system, sets a new standard as an integrating environment at the desktop, without violating the Microsoft *Windows* and Operating System/2 standards."

SIMULTANEOUS WITH THE ongoing introduction of the Precision Architecture — most recently, the 835S and 855S — sales of the already successful line of Series 300 technical workstations continued at near-record levels. Significantly, much of this activity involved government-related aerospace purchases, where systems flexibility and product compatibility are especially critical concerns.

For instance, in the recent $16 million contract with Ford Aerospace and Communications Company for 765 HP 9000 Model 330 engineering workstations, one reason cited for selecting HP hardware was the ability to pick and choose from a range of compatible components to build a variety of capabilities and configurations. According to one Ford Aerospace manager, "Compatibility between product line models is a big feature in DOD business."

Another reason cited by Ford officials for selecting HP equipment was its reliability. "The fact that you can subject the HP equipment to a wide range of environmental stress, including shock, humidity, dust and heat was vital," they said. This fact became abundantly clear to Ford test engineers when they nearly melted a Model 330 unit in their test oven, yet it continued to be fully operational.

Ford will use the HP workstations in its three-year, $50 million contract to provide the U.S. Army with a computerized battlefield management capability. Called a Maneuver Control System (MCS), it will provide commanders an electronic bird's-eye view of all battlefield activities — a true ruggedization application.

Two reasons recently given by McDonnell-Douglas for choosing Hewlett-Packard for its first UNIX-based workstation entry into the mechanical CAD/CAM market were:

- *HP's full line of PCs, workstations, minicomputers and computational servers; and*
- *HP's commitment to industry standards across a heterogeneous distributed computing environment.*

As described in a $20 million value-added reseller agreement, McDonnell-Douglas will combine its popular *Unigraphics* software with HP 9000 workstations and servers to build a variety of complete CAD/CAM/CAE system configurations.

McDonnell-Douglas has the largest machine shop in the free world at its St. Louis facility and is considered one of the leading CAD/CAM vendors. Its selection as a preferred CAD/CAM vendor by General Motors in late 1987 testified to this ranking.

According to Tom Curry, McDonnell-Douglas' vice president of Marketing and Development, speaking at a press conference during UniForum in Dallas, TX, in February 1988, "HP's commitment to providing computers based on industry standards that fit into our customer's heterogeneous computing environments was a key factor in choosing HP as a workstation supplier. Their commitment to top-end graphics performance was impressive, as was their ready agreement to customize their offerings for our needs."

The first workstations to be installed this year were 30 Model 350SRXs at McDonnell-Douglas' helicopter plant in Tempe, AZ. Later in the year, 825SRX RISC-based units also will be shipped.

The Pomona Division of General Dynamics recently contracted for several million dollars of HP CAE software and Series 300 workstations to be used in the design and production of DOD weapons systems. One of HP's first major contracts in the tough CAE market, it was obtained largely on the basis of HP's superior EE and ME software.

After completing two years of sales negotiations in the fall of 1987, another premier aerospace manufacturer ordered 162 HP 9000 Series 300 engineering workstations for approximately $4.2 million. This company, which for competitive reasons didn't want its name mentioned, chose the HP machines because it needed state-of-the-art graphic display capabilities for its automation design project. The project's principal purpose is to use advanced computing technology to reduce by one full year jet-engine design cycle times for advanced aircraft.

Since it already uses Cray supercomputers for most of its more demanding computational needs and, since it could get the same "leading-edge," high-tech drafting board capabilities it needed from both HP Series 300 and Series 800 machines, it chose the less expensive Series 300 workstations to optimize its price/performance.

The most significant sales development to date, in terms of the new HP Precision Architecture, is the three-year, $30 million contract signed in early 1988 for several hundred Model 825S workstations. The purchaser is a large, multinational petrochemical services company located in the Midwest.

The buyer is using these computers to perform real-time, down-hole geophysical monitoring on both off-shore oil platforms and truck-mounted mobile units worldwide. Although the high-end computational capabilities of the 825S are needed, the most crucial factor in selecting this particular model was its unique ruggedization characteristics. The purchaser wanted a very tough machine, able to withstand all types of harsh environments. After performing a series of extreme "shake-and-bake" procedures in its own lab, the buyer found that the Model 825S successfully met all expectations. — *Richard M. Voelker is a free-lance writer based in Pittsburgh.*

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WHAT IS CASE?

Where Is The Computer-Aided Software Engineering Market Going And What Is HP's Place In It? Part 2

CASE

Peggy King

Hewlett-Packard's definition of CASE is necessarily broad in order to encompass the company's diverse roles in relation to software engineering teams who are customers for CASE products, groups in several divisions who are developing CASE tools both for internal use and for sale, and a training program to promote the best practices in software engineering.

In addition, the newly formed Software Development Environments, a technical marketing group, is beginning to offer consulting services for key workstation customers who are in search of integrated CASE solutions for automating software development. HP's role as a joint marketer for third-party products running on the HP 9000 Series workstations will be discussed in the last article of this series.

Software Development Environments and Corporate Engineering share responsibility for formulating HP's CASE strategy. Software Development Environments has defined CASE as a "set of tools as well as training and services required to support and automate the software process." This definition encompasses all stages of the software lifecycle from requirements and analysis through design, documentation, testing, maintenance and reuse.

Included in this definition are tools for "the management of personnel and other resources involved in producing software." Any software that helps to manage people, documents or objects involved in software development is part of the CASE strategy. Software objects can include data flow diagrams, code, text files and test; in other words, a broad range of activities that span the software lifecycle.

Project management, version control, publishing tools, document processors, configuration management and estimating tools also are included in HP's definition of CASE.

How does HP implement its definition of CASE as a customer for CASE tools, a developer of tools and a consultant for its hardware customers?

Within HP, more than 4,000 software engineers are users or potential users of tools that automate software development. One impetus for learning to use these tools is the corporation's emphasis on total quality control directed toward fulfilling its 10X goal for software quality by 1991.

John Young's well-publicized goal for a tenfold reduction in hardware failures, which began in fiscal year 1981, was expanded to include software quality in April 1986. The goal is to reduce critical and serious open problem reports by a factor of 10. The goal also extends to all software problems reported in the first year of a product's life.

The 10X program for software products calls for these problem reports to be reduced tenfold within five years. To go beyond current high quality standards will require new automated tools and process improvements that help make software development processes predictable and repeatable.

BUT TOOLS BY THEMSELVES don't make the difference. Without training in structured analysis and design, testing methods, defect analysis and tracking and software metrics, tools merely automate the old methods that led to defective software. Through Corporate Engineering in Palo Alto, HP has offered courses in Structured Analysis and Design since 1984. These courses train trainers who in turn offer courses to software engineers working on software projects on a variety of plat-

forms and for various end users and customers.

As a CASE customer, HP seeks the methods and tools necessary to meet the 10X goal for defect-free software by 1991.

. . . software toolsets sometimes come about in response to problems . . .

Since no one methodology will work for all software development projects within the company, neither Corporate Engineering nor Software Development Environments group members see their role as prescriptive. Rather than identify which tools to use, Corporate Engineering's role is to provide training for methodologies that show engineers new processes for software development.

The kind of automated tools to be used depends upon the application being designed, the language used and the platform. Only after software developers understand and begin using new methodologies for producing software will the automated tools help them eliminate design defects.

Marc Barman of Corporate Engineering stresses the need to understand how to do structured analysis and design "by hand" before beginning to implement tools. Training programs from Corporate Engineering are designed to identify best practices and provide training that promotes their use. Experts on structured design and analysis who have conducted seminars on structured design include Meilir Page-Jones, author of *The Practical Guide to Structured Systems Design*, and Impiaz Pirbhai, who worked with Derek Hatley to develop real-time extensions to HP's version of *Teamwork* and Tom DeMarco, author of *Structured Analysis and Systems Specification*.

In HP's role as a developer of CASE tools, whether for internal use or for release as products, the emphasis is on tools that apply to more than one phase of the software lifecycle. These software toolsets sometimes come about in response to problems in a specific application within the engineering, manufacturing or business/data processing environment. The Device Interface System introduced in May 1988 is an example of an HP-developed product that is useful in various phases of the software development cycle and that provides new solutions to the problem of developing and maintaining communications software on the factory floor.

On a typical plant floor, there may be a variety of devices that communicate through proprietary communications

languages because standards to handle device connectivity are just beginning to become accepted. Therefore, programmers who implement communications links between equipment from various vendors and even between different models of the same machine have to write large C or FORTRAN programs. Engineers at HP's Industrial Applications Center in Sunnyvale are working on a toolset to help programmers create communications software without writing code.

The Device Interface System, one of the Industrial Precision Tools from the Applications Center, is a software development tool for programmers to link factory floor devices and subnetworks to Series 800 computers. Each of its four facilities automates a "backend" phase of the software lifecycle.

The Communications Implementation Facility replaces traditional coding with a higher-level language to allow a developer to implement a communications link with far fewer lines of C or FORTRAN. The Comprehensive Testing Facility automates the testing of communications links by providing specific tools supported by HP.

A Documentation Facility automatically generates documentation for the developer. When the high-level language link is used, developers create automatically generated documentation by selecting objects. The Programmatic Access Facility allows user programs to access communications links at runtime from C or FORTRAN, thereby reducing long-term maintenance costs.

AS A CASE VENDOR and a promoter of third-party tools that run on HP workstations, HP plans to offer customers integrated software development environments suited to their needs. In the technical sector, this environment means having a core capability and then adding other tools according to the application and the type of software development.

HP can help customers build industry-specific CASE environments. For example, in the Military Aerospace sector, the HP 9000 platform offers Ada Specific Tools and documentation support for Mil Spec 2167. For developers of embedded systems, HP offers cross development and microprocessor development tools.

In HP's diverse roles as CASE tool customer, developer, vendor and consultant, the common theme is that tools be integrated and that users learn about structured design and analysis and software metrics before introducing automated tools.

Part 3 of the series will spotlight some of the principal third-party products that run on HP workstations and HP's licensed version of *Teamwork*. *—Peggy King is an independent consultant and free-lance writer based in San Jose, CA.*

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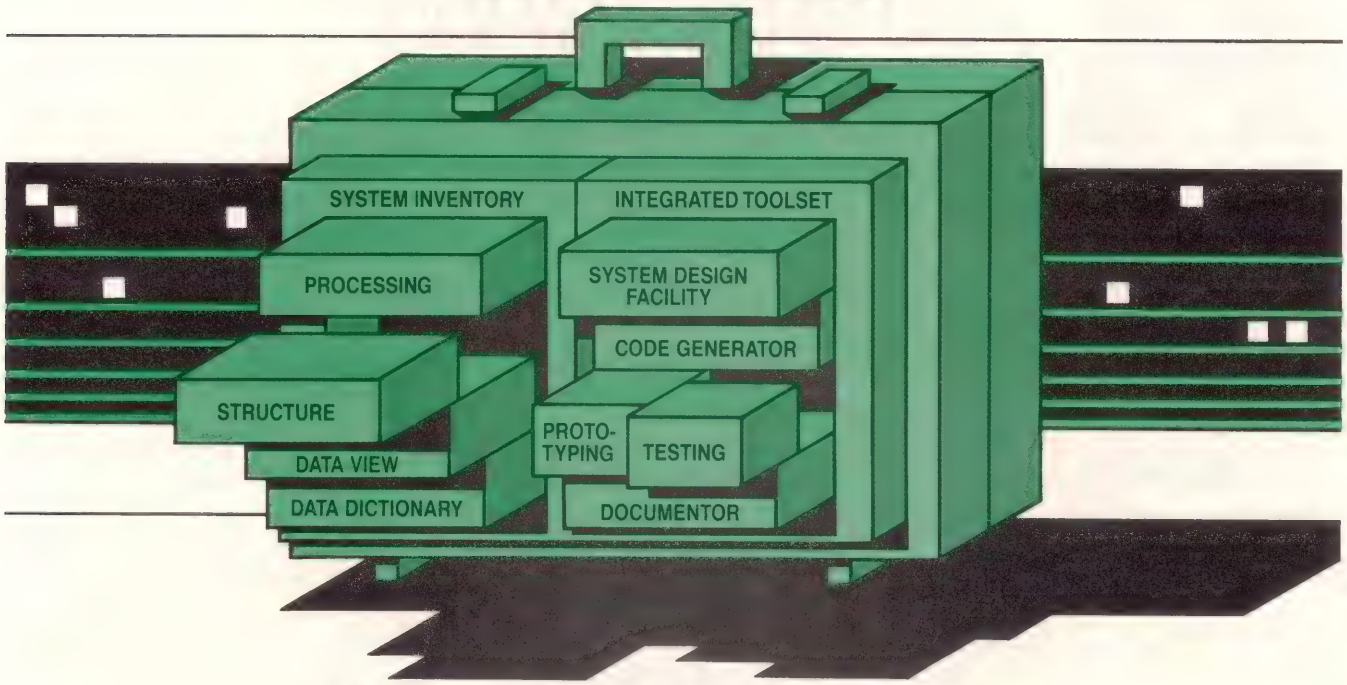

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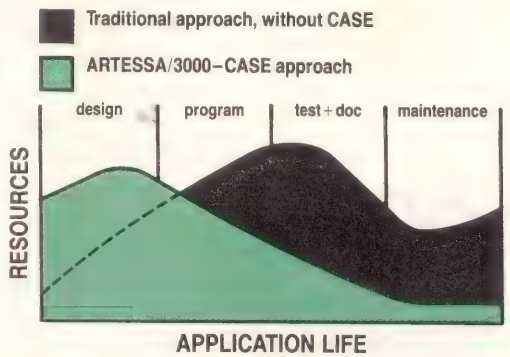

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ALTERNATIVES TO *HP Word/3000*

Making A Choice When Migrating From Your 3000 Word Processor To A PC Product Isn't Always Easy

SOFTWARE

Mark Sampson and Sandy Atwell

Hewlett-Packard's office automation strategy is for word processing users to change from *HP Word/3000* to *AdvanceWrite* or other PC word processors. If users decide to change to PC word processors, there are a number of good products available.

Most of the leading word processors have released improved versions in the last year that include desktop publishing features. *HP Word* doesn't seem to be keeping up with the competition, while HP appears to be improving *AdvanceWrite* to remain competitive. In addition, a minicomputer, like the HP 3000, which is supporting multiple users, cannot provide nearly the processing speed and support of graphics features of a Vectra ES or IBM AT.

In deciding what PC word processor to select, *HP Word/3000* users need to consider several points:

- *How extensive is the investment in* HP Word/3000 *documents and training?*
- *What PCs will be used? HP 150s? Vectras? IBM-PCs? new purchases?*
- *What word processing features are important?*
- *What is the value of a one-vendor solution?*

In migrating from *HP Word/3000*, we need to take a look at the different word processing alternatives available in the HP 3000 environment. We will compare several of the leading word processors, including all of those sold by HP. The points you should consider when choosing a word processor include:

- *Available for what PCs?*
- *How difficult is it to convert* HP Word/3000 *files?*
- *How different is the user interface from* HP Word/3000?
- *If it's very different, is it difficult to learn and use?*

Figure 1 shows the relative degree of document compatibility with *HP Word/3000*. Almost all word processors can translate the text (ASCII characters) to and from *HP Word/3000*, but enhancements, such as underlining, will be lost. *HP Word/PC* enjoys the greatest degree of compatibility because files can be converted between it and *HP Word/3000* with every enhancement still intact. This even includes such things as the system date variables and catalog information.

AdvanceWrite and *Samna* are the next most compatible because a very capable conversion program between *HP Word/3000* and *AdvanceWrite* is available in *HPDesk*. Since *AdvanceWrite* and *Samna* can read each other's files, the program is also converting to and from *Samna*.

The next degree of compatibility is any word processor that has a Document Content Architecture (DCA) conversion. Conversion to and from DCA will preserve most enhancements, including underlining, bold and superscript. A utility can be added to *HPDesk* to convert between *HP Word/3000* and DCA.

The lowest level of compatibility is an ASCII conversion, which removes most text enhancements and leaves only the ASCII characters. The ASCII file then can be converted by the PC word processor.

DCA or ASCII is used as an intermediate format for document conversion. You convert a document from one word processor to DCA and then from DCA to the second word processor. DCA has emerged as the current standard format for converting word processing documents. Using ASCII as the intermediate step is a poorer choice. The best conversion, of course, is a utility program such as Word-for-Word that converts directly.

Figure 2 compares selected features of several of the leading word processors. The availability of a version for the TouchScreen (HP 150) and Macintosh are indicated. All of those listed will run on the Vectra and IBM PC.

They also can convert files to and from ASCII. All except *HP Word/PC* and *WordStar Professional* can convert to and from DCA.

IF AVAILABILITY FOR THE TOUCHSCREEN is important, only several leading word processors are available. *WordStar* and *MultiMate* quickly were made available for the TouchScreen because they were very popular at the time of their release. However, the latest versions aren't available for the TouchScreen. *HP Word/PC* is fully supported by HP on the TouchScreen and can exchange files with *HP Word/PC* on the Vectra and IBM PC. *WordPerfect* was adapted for the TouchScreen by a third party.

If Macintoshes are invading your organization, word processors available for them include *WordPerfect* and Microsoft *Word*. Transferring the files between the Macs and the MS-DOS computers is another issue, of course. Also, the user interface may be different when a word processor is rewritten for the Mac.

AdvanceWrite has rather strict keyboard requirements and HP will not promise to support it on IBM PC compatibles. All of the other word processors discussed are supported on compatibles.

HP Word/PC requires either a TouchScreen with 512K RAM and two disc drives or a Vectra with 640K RAM and two disc drives (for the Vectra, one drive must be either a hard disc or 1.2M high-density disc). The cost is $460.

Its advantages are that it has the same user interface as *HP Word/3000*, so retraining is negligible and files can be converted between *HP Word/3000* and *HP Word/PC* with almost no loss of content by using the "PCWDCONV" utility on the HP 3000. Documents also can be moved between *HP Word/PC* on the TouchScreen and the Vectra after they're copied to the correct size disc. Graphics can be imported from the *Gallery Collection* (*Drawing Gallery* and *Charting Gallery*) if you have a hard disc.

Disadvantages include complete support for only the HP LaserJet,

FIGURE

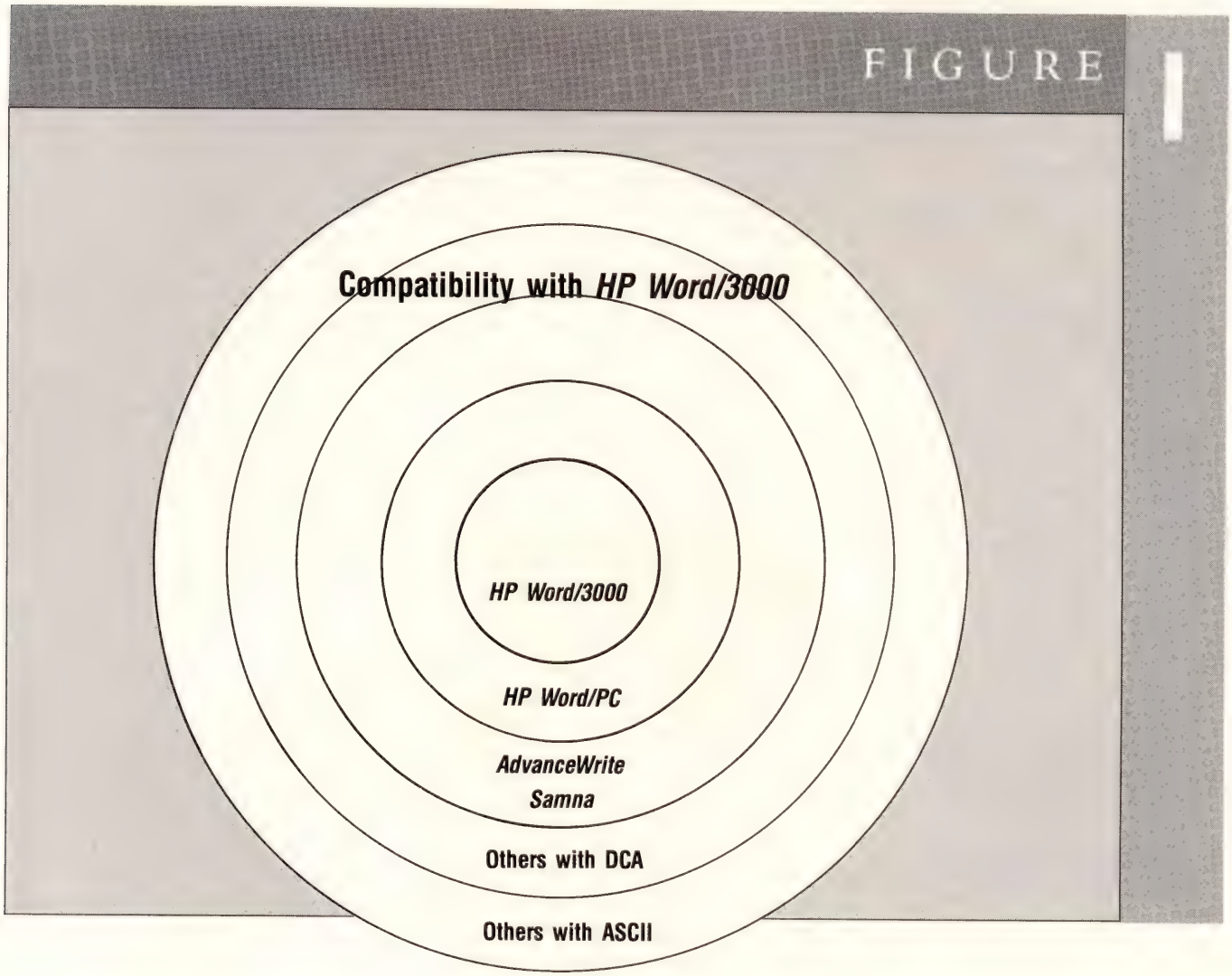

FIGURE 2

PRODUCT	** AVAILABLE FOR ** VECTRA	HP 150	MAC	** CONVERTS ** DCA	ASCII	OTHER	COST
HP Word/PC	Y	Y	N	N	Y	1	$460
AdvanceWrite	Y	Y	N	Y	Y	2	$710
Samna	Y	N	N	Y	Y	3	$695
Exec. MemoMaker	Y	Y	N	Y	Y		$250
WordStar Prof.	Y	Y[4]	N	N	Y		$605
Microsoft *Word*	Y	Y[5]	Y	Y	Y		$495
WordPerfect	Y	Y[6]	Y	Y	Y	7	$495
OfficeWriter	Y	N	N	Y	Y	7	$495

1. Conversion to and from *HP Word/3000*
2. Conversion to and from *HP Word/3000* using *HPDesk*
3. *Samna* and *AdvanceWrite* can read each other's documents directly
4. Release 3.34 for TouchScreen; 4.0 for Vectra and IBM PC
5. Release 1.1 for TouchScreen; 4.0 for Vectra and IBM PC
6. Third-party adaptation
7. Also converts *WordStar* and *MultiMate* documents

Compatibility of selected word processors.

ThinkJet, 2601A, 2602A (TouchScreen only), 2603A and no non-HP printers. File conversion to and from ASCII format is supported, but not to and from DCA. This means that after documents are converted from another word processor, they probably will require some cleaning up and some enhancements will be lost.

AdvanceWrite requires a Vectra or IBM PC with 384K RAM and two disc drives. The new "enhanced" keyboard is required. The cost is $710, and it's available directly through HP.

The advantages are HP support, document conversion from *HP Word/3000* using *HPDesk*, ease of learning and use, and some advanced features. *AdvanceWrite Plus* offers line drawing, some desktop publishing features and a spreadsheet. Documents can be translated to and from DCA format for exchange with other word processors, and also to and from ASCII format.

Several printers are completely supported: HP LaserJet, ThinkJet, 2601A, 2932A, 2934A and PCL. Partial printer support is provided by drivers that are included for 16 other non-HP printers plus a universal printer driver, which will support most functions.

The user interface is quite different from *HP Word*. It uses templates for several areas of the keyboard. After pressing a command key, prompts are displayed on the screen. Context-sensitive help also is available by pressing the "F1" key. A good spell-checker is included.

The program supports line drawing by simply holding the Ctrl key while moving the cursor. Documents can be converted from *HP Word/3000* using *HPDesk* for downloading. You can convert documents, but you need a colon prompt or a special program like *Desk Direct* to download them.

Disadvantages include fairly high cost and support for a relatively small number of printers. The current version isn't available for older keyboards. It will not run on the TouchScreen.

Samna requires 512K RAM and two discs. A hard disc is required for the spreadsheet, thesaurus and file conversion. It will run on any IBM PC-compatible, but not the HP TouchScreen. *Samna Plus IV* costs $695

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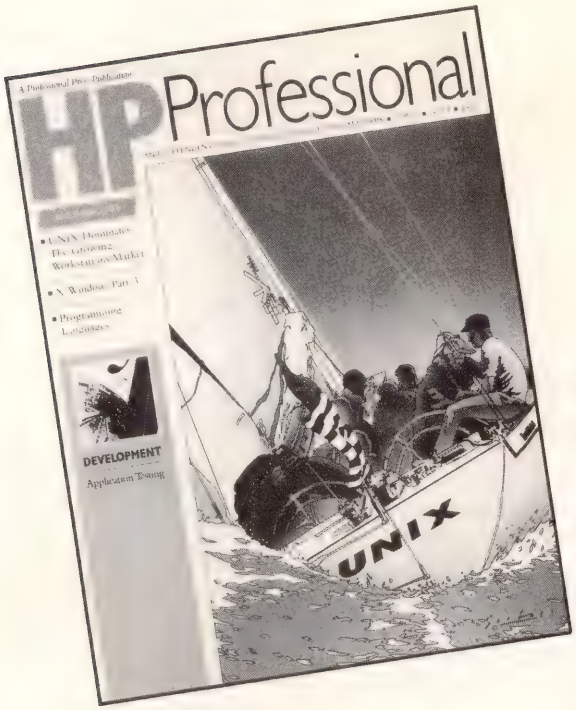

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while *Samna IV*, which doesn't include the spreadsheet, costs $595.

Samna is very similar to *AdvanceWrite*, which was developed jointly by Samna and HP. They can read each other's files without any translation. They have about the same features and the user interfaces are very similar. The only significant differences are that *Samna* uses fewer command keys than *AdvanceWrite* with some of the function keys performing additional tasks.

Switching between *Samna* and *AdvanceWrite* is easy, but not automatic. For example, "Print" is F5 in *AdvanceWrite* and F3 in *Samna*. You can't switch between *Samna* and *AdvanceWrite* without a template. The *AdvanceWrite* conversion from *HP Word/3000* also works for *Samna*.

The advantages of *Samna* over *AdvanceWrite* are that it will run on more computers and costs slightly less. It supports more than 100 printers. The disadvantage of *Samna* is a lack of HP sup-

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WordPerfect
WordPerfect Corporation
288 West Center
Orem, UT 84057
CIRCLE 275 ON READER CARD

WordStar, WordStar Professional
MicroPro International Corp.
33 San Pablo Ave.
San Rafael, CA 94903
CIRCLE 274 ON READER CARD

port. Also, *Samna* is noticeably slow without a hard disc and 80286 processor.

WordPerfect runs on any IBM PC-compatible, the HP TouchScreen (a third-party adaptation) and several minicomputers. It requires 192K RAM and two floppy discs. The cost is $495. A separate "CONVERT" utility program is included that supports DCA conversion as well as conversion between *WordStar* and *MultiMate*. A large number of printers are supported.

The user interface is very different from *HP Word* in its basic approach. It relies on the 10 function keys, each of which performs four functions. Some functions, such as listing files or printing, are very easy. Other functions, such as moving text or searching for text, are not intuitive and require too many keystrokes. The spell-checker and thesaurus are excellent. Graphics and some desktop publishing functions will be included in release 5, which is due out by the time you read this article.

OfficeWriter requires 384K RAM and two floppy discs for release 6.0. A hard disc will let you avoid swapping diskettes for such functions as spell-checking. The cost is $495. *OfficeGraphics* is a $145 add-on package that allows graphics importing. DCA conversion is supported as well as conversion to and from *WordStar* and *MultiMate*.

OfficeWriter isn't the most widely known word processor, but those experienced in *HP Word* may want to consider it because of its user interface and features. *OfficeWriter* is the easiest to learn and use of any of the word processors discussed, but its greatest appeal may be its similarity to the *HP Word* user interface.

When you first start *OfficeWriter*, you're presented with a function key menu that includes "create," "edit," "print" and "exit," which are all similar to the *HP Word* function keys. You also see up to 45 documents listed alphabetically. When you create a document, you're asked to create a catalog entry with "subject, author, operator and comments" similar to *HP Word* and *AdvanceWrite*. The catalog can be displayed and printed. Cursor movement also is similar to *HP Word*.

When creating or editing a document, the user interface relies on the function keys, similar to *WordPerfect*; but since everything except the edit functions are on separate menus, the template is less cluttered. The insert mode functions exactly like *WordPerfect*'s. It, too, has an excellent spell-checker and thesaurus and its method for copying documents is the point-and-shoot method.

Microsoft's *Word* requires 256K with a graphics board recommended. The price of the newest version (3.11) is $495. Although the version that we evaluated wasn't the newest, we found little or no similarity to any *HP Word/3000* functions as we know them. There lies within Microsoft a command line similar to *Lotus 1-2-3*. Although simple functions seem easy to learn, the advanced features aren't quite as intuitive.

On the version we evaluated, the insert function, for example, was very cumbersome. The screen clear from the point of insertion then repaints after insertion is complete. The package does include Microsoft *Spell* and a thesaurus that can be accessed directly from within a document. *—Mark Sampson is a PC coordinator and Sandy Atwell is a training administrator at Gould Inc., Glen Burnie, MD.*

OfficeWriter isn't the most widely known word processor, but those experienced in *HP Word* may want to consider it . . .

DEVELOPMENT

Lisa Burns Hartman

Doing It Right, Then Doing It Better

Does this scenario sound familiar to you? It's time for another software release and your project team is working furiously to complete everything for the installation deadline. Some bugs have been encountered during the unit and system testing, and they look tough to fix. The users came in last week to try out the new screens. They're generally happy with the system, but want some changes to VPLUS field placement and enhancements. The error messages aren't quite what they wanted either. During system testing, you ran out of disc space several times, the test data in your interface file didn't match up with your test cases, and the group and account structure didn't match up with production. The installation tape is missing a few files, which caused some problems for the parallel installation test.

This seems to be the story of a software development process that's on the right track, but one with a few problems. The team probably will get through the user installation and get signoff, but certainly not as quickly or as easily as everyone would've liked. I wonder what will happen on their next project — Will they encounter the same problems, or will they make adjustments to their software development process to address those problems?

IN THIS ARTICLE, I'll describe a method that our shop has used to continuously improve the software development process. Release debriefing meetings can help your project team identify problems in the process and implement solutions. I'll discuss how to prepare and conduct a project-debriefing meeting and discuss how a debriefing meeting

The team brainstorms solutions to prevent the problems from cropping up during the next development project or product enhancement release.

can help your shop develop software even better than you do today.

A debriefing meeting is the term I use for a meeting held at the end of a project to identify the good and bad points of the project. During the life of the project, team members take note of what went particularly well and what problems were encountered. They also note how improvements could be continued or problems could be avoided in the future. Then, at the meeting, project members sit down to identify these good and bad points for each phase of project development. The team brainstorms solutions to prevent the problems from cropping up during the next development project or product enhancement release. Finally, the team works to assign responsibility for each

FIGURE 1

ANALYSIS AND DESIGN PHASE
■ User input ■ Selection of features or changes ■ Specifying features or changes
CONSTRUCTION PHASE
■ Coding new modules or changes ■ Unit testing new modules or changes ■ Interface testing ■ Writing and testing installation procedures
SYSTEM TEST PHASE
■ Integration testing ■ Production Alpha test period
TRAINING AND DOCUMENTATION
■ User training ■ Release documentation -Specification documents -User guides -Operations guides

action item identified. The improvements will be implemented immediately in the next project.

WHAT KIND OF BENEFITS can you expect from these meetings? Debriefing meetings can help identify problems in all phases of a development cycle. For example, identifying problems with specifying new modules can lead to improvements in user communication during the design phase. Identifying problems encountered during testing can point out the need for additional hardware or improved test scheduling on the next project. By pinpointing problems with interfaces, project teams can improve the communication they have with interfacing teams for the next release. Finally, by examining the installation and Alpha test process, the team can ensure that the next project runs smoother and has no adverse effect on user productivity.

The steps listed below will assist you in implementing debriefing meetings.

1. Alert the project team.
2. Analyze your development cycle.
3. Schedule the meeting.
4. Choose the participants.
5. Prepare for the meeting.
6. Conduct the meeting.
7. Follow up on recommendations.
8. Continue process improvement on every project!

The first step is to alert the project team to look for problems encountered as they work on a project. Let them know that you're serious about improving the development process and that you want their input. Let them know that as they identify these problems they also should be alert to solutions. My suggestion is to introduce the idea of process improvement during the first phase of a project in progress. Let the team know that a meeting to discuss their findings will be held at the conclusion of the project so that the debriefing meeting won't be so far in the future that they'll forget about it. Problems will be fresh in their minds as they enter the first meeting.

FIGURE 2

ANALYSIS AND DESIGN PHASE

- User input
  - -Were users happy with the design as delivered?
- Selection of features or changes
  - -Were any user needs not met?
  - -Were any necessary system changes overlooked?
- Specifying features and changes
  - -Were specifications adequately detailed?
  - -Did specifications change during coding?
- General
  - -Were any scheduling problems encountered?
  - -Were all software walk-throughs conducted promptly?

CONSTRUCTION PHASE

- Coding
  - -Were specifications adequate to code form?
  - -Was additional investigation required?
- Unit testing new modules or changes
  - -Was test data difficult to create?
  - -Was necessary hardware available for testing?
  - -Was disc space available?
  - -Were any test cases omitted?
  - -Were any defects found?
- Interface testing
  - -Were interfacing systems available for testing?
  - -Did interfacing teams meet schedules?
  - -Did interfacing teams understand testing requirements?
- Writing and testing installation procedures
  - -Were any installation problems encountered at the user site?
  - -Were any files omitted?
  - -Were correct versions of files included?
- General
  - -Were any scheduling problems encountered?
  - -Were all software walk-throughs conducted promptly?
  - -Were version control procedures followed?

SYSTEM TEST PHASE

- Integration testing
  - -Was GROUP and ACCOUNT security correct?
  - -Were USERS in place?
  - -Did files and users have correct capabilities?
  - -Did compile and prep of finished code run smoothly?
  - -Were correct versions of files ready for integration?
  - -Were any stack overflow problems encountered?
  - -Was test environment accurate and available on time?
  - -Was disc space and hardware available?
  - -Were correct versions of interfaces in place?
  - -Was test data available?
  - -Was test environment stable for life of test?
  - -Were correct versions of products, operating system, third-party software, and interfaces in place?
  - -Were any defects encountered?
  - -Did interfaces run correctly?
  - -Were adequate test cases used?

Continued.

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FIGURE 2

SYSTEM TEST PHASE (continued)

- Production Alpha test period
  - -Were users happy with the software?
  - -Was user site adequately prepared?
  - -Was necessary hardware and disc space available?
  - -Were correct versions of products, operating system, third-party software and interfaces in place?
  - -Were any defects encountered?
  - -Were any enhancements required for signoff?
  - -Was any downtime encountered?
- General
  - -Were any scheduling problems encountered?

TRAINING AND DOCUMENTATION

- User training
  - -Were users happy with training?
  - -Were users adequately prepared for using the new software?
  - -Were any incorrect points found in the training?
- Release documentation
  - -Specification documents
    - -Were documents understandable to users?
      - -to management?
      - -to technical personnel?
    - -Were any errors found?
- User guides
  - -Were users happy with manuals?
  - -Were any errors found?
- Operations guides
  - -Were technical staff happy with manuals?
  - -Were any errors found?

The next step in improving your software development process is to take a step back and describe the steps you follow in developing a new system or in making changes to existing software. This life cycle can be used to structure your meeting so that problems noted can be associated with a given development phase. If your company has a development life cycle in place, this may be an easy task. If you are a smaller, more informal shop, you may have to do a little more thinking to break down your process into phases.

Figure 1 shows a fairly general life cycle for the development process. With a little work, you should be able to adapt this list to your own shop's process.

Now that you've identified your software development phases, it's time to schedule the meeting. You should allow for two to three hours, more for large projects. Our shop has found it most successful to conduct this meeting within a few weeks of completing a release and receiving the okay from the project's user group. This way, team members don't forget what went well and not so well during the development of the project. Also, by conducting the meeting before the next project has gotten very far along, the project team can implement the suggestions made to improve the development process and ensure that the procedures used for the next release will be better!

Now we need to identify who should attend the meeting. All team members directly involved with the software development should be there. In addition, you may want to get input from interfacing teams and users. If they can't personally attend, get their comments and suggestions beforehand. Finally, if operations staff helped conduct testing for you or arranged for hardware, you may wish to have them present as well.

Once the meeting has been scheduled, the participants should take some time to prepare their notes on what went well for the project and what did not. Especially for the first meeting, you may want to help them prepare by giving them a list of things to consider.

Figure 2 shows a list of questions that may help project members review each phase of the completed project. You'll want to add additional points from your own experience and from your own shop's life cycle.

Now it's time to conduct the meeting. The project manager or a technical leader should lead the meeting. Going through a project phase by phase has worked well in our shop. Beginning with the first phase, ask the team members for their input on what went well first. This helps begin the meeting on a positive note and gives credit to team members for doing things right. As you note what went well, pay particular attention to improvements suggested by team members in previous debriefings. This will show team members that you're serious about process improvement and value their input.

After the team identifies what went right in a given phase, think about what went wrong or what could've been even better. Take a look at defects found in a phase, how much time was wasted, user misunderstandings and anything that caused rework of designs, coding, testing, or documents. Was there enough user communication? Was the problem an omitted test case? Concentrate on identifying the source of each problem encountered.

Once problems have been identified, it's time to brainstorm solutions. You can do this after you complete the discussion of each phase, or after you've worked through all phases. I prefer to

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FIGURE 3

- **Improvement**
  - -Scheduling was better for walk-throughs. Some walk-throughs still had to be held right before code freeze, but this may be unavoidable.
- Follow-up
  - -Keep it up for the next release!
- Responsibility
  - -All team members.
- **Problem**
  - -Omitted international test cases caused problems during system and production testing.
- Solutions
  - -Add international transactions to unit test plans when appropriate.
  - -Bring users in to conduct system tests with production data.
  - -Watch out for effect of international data on report designs.
- Responsibility
  - -All team members.
- **Problem**
  - -Due to disc space problems, system testing had to be moved to different hardware several times.
- Solutions
  - -Ensure that one machine is available for length of test, and that adequate disc space is present.
  - -Purchase hardware for new test machine if possible. This will ensure adequate space and a stable environment.
- Responsibility
  - -Project manager, Operations staff.

brainstorm solutions at the end, since one solution may solve several problems. In any event, look for creative ways to alter your development process to prevent problems and continue the improvements and procedures that were right. Solving problems in the design phase may involve better user communication and prototyping of new designs. Testing problems may require better data and perhaps additional hardware. Whatever the solution is, ensure that it is truly feasible, or generate several alternatives if there's a question. Examples of problems and proposed solutions from our shop are shown in *Figure 3*.

Figure 3 also illustrates the next step: assigning responsibility for implementing each improvement. After solutions are identified, work with the project team to assign tasks to the specific person or group who can best implement the solution. This will help ensure that action is, in fact, taken toward improving your development process. Test writers, documenters, programmers, user representatives and project managers may be assigned appropriate tasks. Alternately, responsibility may be given to the whole team in cases where cooperation is needed for improvement. In any event, all problems, improvements and responsibility assignments should be published in the minutes of the debriefing meeting so that everyone is clear on their action items.

As the team begins its next project, process improvements should be implemented. The next step is to ensure that these improvements are actually occurring. Typically, project management is in the best position to do this. Management may have to become involved in cases where additional equipment or software is needed for improvement; for example, in purchasing a new HP 3000 to conduct testing, or buying a new source-compare program. Also, management can work with individual project members to see if proposed solutions are working. If the solution isn't working well or hasn't been implemented, management can work with the programmer or administrator to address the situation.

It's also important to note during the follow-up step that the project team need not wait until the next debriefing meeting to fix a problem. Now that the team members have been alerted to watch for problems and suggest solutions, chances are that they'll do so throughout the life cycle. This is to be encouraged. Noting these enhancements during the next debriefing meeting can be further motivation for constant improvement.

The last step in implementing debriefing meetings in your shop is to do it again — continue the process improvement on every project. Chances are, as you refine your process it will become better and better. Your development team, too, will become better and better at identifying and solving process problems. However, new technologies in hardware and software will introduce new problems that will need to be addressed. The work never stops!

HERE ARE SOME TIPS for making debriefing meetings work in your shop:

1. Keep it positive.

The meeting leader must work to keep the discussion on a positive note. If team members begin griping, the leader should say something like, "Well, you're right. That experience was no fun. How can we avoid repeating it?" This should help motivate team members to focus on problem prevention for the future.

2. Keep it non-threatening.

There will be times when a problem is the direct or indirect result of someone's error, or lack of follow-through. The meeting leader, as well as all team members, must focus on how to prevent future problems, not on assigning blame for past ones. It's very important during this time to keep the meeting positive and non-threatening. Take the same approach you would use in a software walk-through and keep the comments constructive. Instead of saying "Tommy's program had a bug," say, "There was a logic error in module 1200," or "The specifications for module 1200 were incorrect."

3. Encourage all team members to participate.

Everyone on the team should feel free to identify what went well and what did not on a given release. New team members, while not always familiar with the procedures in place, may be valuable for giving a new perspective and suggesting innovative changes to your development process. Encouraging input from these members can help prevent a "We've-always-done-it-this-way" attitude and help encourage positive change.

4. Get management support.

This is perhaps the most important point of all. Project members quickly will decide whether or not management is committed to solving problems in the development process. If a solution to a particular problem is assigned to management, and no action is taken, team members will feel much less inclined to do their own part in solving process problems. For example, if the team members are unanimous in their recommendation that a new test machine or other test hardware is essential for improvement, and management isn't willing to foot the bill for this equipment, team members will notice. Management support of improvement is critical.

Problems in the software development process affect everyone on the team, especially your users. Encountering the same problems on project after project can be very frustrating and demotivating. A sign that efforts toward process improvement are working in your shop is that each software project or new enhancement release presents completely different problems than the last one did. Believe me, new problems are much more fun! — *Lisa Burns Hartman manages an internal business software programming team at Hewlett-Packard corporate headquarters, Palo Alto, CA.*

DESKTOP PUBLISHING

John Barnes

Death To Privileging?

One of the tasks in looking into the future is to see beyond the new product or concept's capabilities and look at what those capabilities allow people to do.

The standard example is the automobile. In 1910, most people could see that cars could get them around without the bother of meeting a train schedule, could go more places than trains, and didn't require specialized operators like trains. A science writer at the time might have written about them as very convenient trains and, if he had, he'd have missed completely their impact on the shape of cities, displays of status, mating habits, vacations, employment structure and so forth.

What really made the difference was that the automobile redefined people's day-to-day relationships to space, distance and time.

Something a mile away was much farther in 1895 than it was 30 years later; a weekend trip was much more conceivable for many more people. Children no longer could be supervised up to the moment of marriage because they could get farther away in less time. People with cars needed different products, services and facilities than people with horses and carriages, and they needed to be able to drive to them; and once they were driving to one business, they wanted to drive to all of them.

Would a science fiction writer in 1900 have been able to forecast McDonalds, shopping malls, entrance ramps — or the sexual connotations of "back seat"?

IN THE SAME WAY, when we talk about the future of desktop publishing, it's easy to say, "It makes it cheaper and easier for people to turn out good-looking text." That was obvious a long time ago.

The important question is, what will people do with this ability? One way to approach that question is to ask, what features of our document handling in the past have been governed by physical characteristics of the system? In other words, what have we always done because we always had to do it? Which of those things will the new technology change?

I don't pretend that this is exhaustive, but there are two major changes that I think are clearly in the wind: the economies of scale in publishing, which will be important in the short run, and the semiotic phenomenon of privileging, which will be crucial in the long run. Each may well reshape the world in unpredictable ways.

The economies of scale in the publishing industry have changed a great deal quantitatively since Gutenberg's day, but qualitatively they haven't changed at all. It still costs much more to set up a book production process than it does to produce books — just like Gutenberg who spent much more time setting type than actually operating his press.

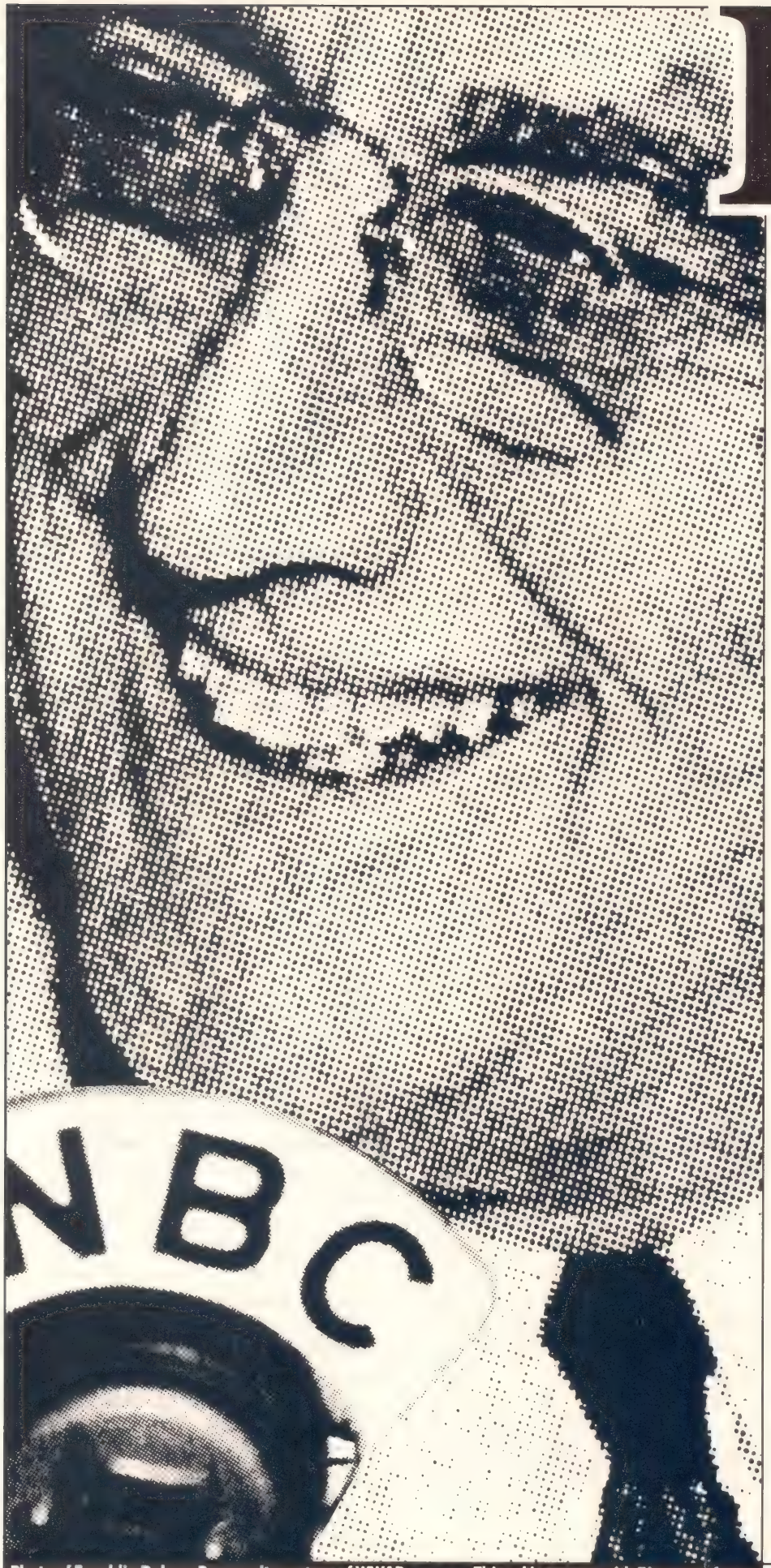
Thus, it pays to operate in such a way that you do as few setups as possible per thousand books sold — which is why publishers are always looking for a bestseller, why new authors without track records find it hard to get published while established authors of several bestsellers can sell a book before writing a word of it, why there's a minimum number of interested people needed for a successful magazine or newsletter, and so forth.

. . . what features of our document handling in the past have been governed by physical characteristics of the system?

This will not be reversed entirely by the DTP revolution, but the cost differential between setup and marginal production is shifting drastically. Most of the cost of setup in traditional publishing was in typesetting, a slow, laborious and often inaccurate process.

DTP has changed this already — anyone with a Macintosh and page layout software is better equipped for typesetting than anyone in the world was in 1970, and the process itself is now a simple job, not skilled labor.

This will mean, in general, that greater diversity and less centralization will pay off in publishing. The effects may well be similar to those of FM radio or cable TV — many more kinds of published material, addressed to much narrower publics. This may mean the end of the bestseller as we've known it, but it also means that people who've had trouble finding what they want to read are much more likely to get it. Bookstores may have to go back to serving as catalog stores, or they may have to go beyond it. The bookstore of 2010 may look more like Kinko's than B. Dalton. You walk in and ask for a book; they get



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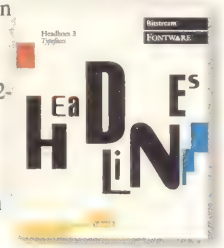

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a copy over modem and print and bind it for you right there. You may very well be buying it directly from the author, bypassing every stage except the retailer.

The shape of periodical publishing may change even further. The whole economic rationale underlying magazines is that the cheapest way for you to get the articles you want is to include them in a one-size-fits-most package. You may not care what Madonna is doing this week, but if you want to read the world news in *Time*, you have to buy the "people" section, too.

Nature and science are essential reading across the sciences — even though most biologists don't read the physics articles and vice versa. But if you can buy only the articles you're interested in, direct from the author through some sort of central clearinghouse, the situation changes drastically.

Furthermore, the written word is not the only thing due to be affected. DTP is a cheaper way than ever before to distribute information, not just text. With the current system of handling information for manufacturing — printing patterns and directions — it is cheaper to "embed" the information in the product and ship that. For example, you sell a T-shirt design by making a T-shirt from it and a wood-stove design by making a wood stove from it and selling the product, not the design. This, too, will change.

As doing custom design and patterns becomes cheaper and easier with CAD, DTP will provide a channel for distributing design as a commodity. Fashion designers will be able to publish patterns for local craftspeople, distributing their own catalogues nationally and adapting their patterns to the customer's individual measurements. Inventors may choose to distribute new devices and systems to very small-scale manufacturers using DTP, and the manufacturers in turn will be able to advertise the product much more cheaply.

DTP might well return us to the days of "bicycle shop engineering," launching a new period of rapid innovation like the one at the turn of this century. Still another effect of the change in economies of scale may be one comparable to that brought on by the printing press — many more people are going to learn to read many more languages.

Right now, a critical bottleneck in the progress of global literacy is that there simply aren't enough textbooks. What textbooks there are are too expensive and, often, the language the student knows best is one in which there are few or no books.

These are all consequences of the simple fact that typesetting has been expensive and printing relatively cheap. Again, it can be expected to change, and with the change will come a booming global market in translations of all kinds and probably greater success for all kinds of nationalist and ethnic movements. These changes may seem like quite enough for the next few decades. Yet my feeling is that in the long run the second-order, semiotic effects will dwarf them.

SEMIOTICS IS A RELATIVELY new discipline, only about 20 years old, that was developed by applying some of the concepts of linguistics to new areas. In effect, semiotics asserts that what we know about a subject and the way we communicate about it are so closely interrelated that we cannot study one without studying the other. It has revolutionized half-a-dozen fields in the social sciences and humanities and is continuing to spread into new areas.

One key semiotic concept is that of privileging. Privileging is the process by which knowledgeable people decide which messages deserve more or less weight. For example, you will react one way to the message, "I have something important to tell you. It might save your life," coming from a man in a white coat with a medical diploma on his office wall and react entirely differently to the same words coming from a man in a cheap suit waving a Bible and shouting at you on a street corner. Or for another

example, an art critic confronted with very simple line drawings will look at them one way if they are by a six-year-old and in quite another if they are by Alexander Calder. "Giant Comet Will Strike Earth This Year, Experts Predict" is one kind of news in the *New York Times* and another kind in the *National Enquirer*.

PRIVILEGING IS THE PROCESS by which we make such decisions. A semioticist would say we "read the metalanguage" to place the message in context. We privilege the words of the doctor over those of the street corner preacher (or perhaps vice versa), the art critic privileges Calder's work over a six-year-old's, and most of us privilege the *New York Times* over the *National Enquirer*.

The metalanguage we have read says that the white coat and medical degree indicate a literal kind of concern about our lives, and the Bible and the style of public speaking indicate a different kind of concern. The critic, knowing Calder's other work and where this stands in relation to it, knows that Calder is drawing this way for a reason, and that the reason is part of the intended meaning. And the simple labels — *New York Times, National Enquirer* — tell us directly how much weight to give to the message.

Documents are messages and, like all messages, they are subject to privileging. For more than a century, the most effective metalanguage to judge the worth of a book, magazine or pamphlet has been the quality of design, graphics and printing. Look at the Jehovah's Witnesses' *The Watchtower*, or the Communist Party's *Daily World*, or the Hare Krishna editions of the *Bhagavad Gita*, and you immediately know that these were put out by organizations without the money for up-to-date graphic design or state-of-the-art printing.

The privileging is so automatic that you don't need to open the magazine, newspaper or book to make the decision. In the same way, most of us can tell a real government document from a sweepstakes offer and serious business correspondence from insurance company advertising without opening the envelope.

There are half-a-dozen clues on the outside (for example, few real government documents feature pictures of Ed McMahon). But DTP allows extreme individualization of documents. Already some political fundraising form letters are receiving replies that indicate that the recipients don't know they are form letters. We may laugh at them right now, but the job is getting harder.

DTP EVENTUALLY WILL PUT first-rate layout and design within reach of everyone and further allow all correspondence to look like person-to-person mail. In other words, DTP will deprivilege the whole world of printed text. You no longer will be able to judge a book, letter, magazine, report, memo or anything else by its cover.

Notice that this is happening at a time when DTP also is greatly increasing the volume of written text any one person can put into circulation, which means that the volume and complexity of written material people must process (most of it directly into the wastebasket) is increasing drastically.

Already many companies are plagued by internal underground newsletters and prank memos. What will happen when they can't be distinguished from real company communications? What will happen when anyone who gets hold of a piece of information — or makes one up — can put it into worldwide circulation instantly? How will we sort through this huge multiplication of messages, every one of which will be carrying the traditional metalanguage for "I Am Important!"? The answers to these questions are not clear, but within most of our lifetimes, we certainly are going to find out. — *John Barnes is the Northwest Regional Manager for ADG, a high-technology marketing services organization based in San Pedro, CA.*

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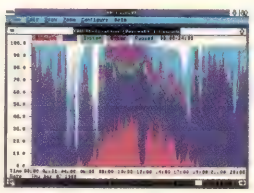

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WORKSTATIONS

Bob Youngquist

Interrupt Service Routines

HP has done well with its PASCAL System for the 9000 series. Although its origins can be traced to a port of the UCSD P System, it has adapted well to a high-performance engineering graphics environment and has proven to be a capable development system for a variety of engineering software. One of its most attractive features is its simplicity.

A number of design considerations have contributed to making the PASCAL System a friendly environment for code development. The PASCAL System, as the name implies, is written largely in PASCAL (actually a PASCAL derivative called Modcal) with low-level and speed-sensitive routines in 680xx assembly language.

Modcal is an extension of the PASCAL language with enhancements for operating system programming. This language supports a modular approach to operating system development and makes high-level language interfacing relatively simple.

The use of the keyboard interrupt services for low-level control of this input device is an excellent example of utilizing system resources from a high-level language.

Access To System Globals

One of the most important enhancements to the PASCAL language found in HP PASCAL is the ability to import and export modules. These modules can be separately compiled units written by the programmer or they can be modules contained in the operating system itself.

Chaining to the ISR is a convenient tool for gaining more direct and detailed control of the hardware.

As with every feature of PASCAL, the necessary declarations must be made to utilize this feature. The following is an example of the declarations necessary to use system features:

```
$SYSPROG ON$

program example(input, output);

$search 'V11:INTERFACE'$

import sysglobals, sysdevs;

.
.
.
```

The first compiler directive **$SYSPROG ON$** enables most of the operating system programming features found in Modcal. Among these extensions are absolute addressing of variables, relaxed type checking, error trapping and procedure variables.

In the example above, the search directive indicates that a file called INTERFACE in the V11 directory will be searched at compile time to resolve references found later in the program. INTERFACE contains only the interface specifications that the compiler uses when it imports a module. The compiler places only references in the compiled code and not actual object code. These references are resolved at run time by the linker-loader.

Procedure Variables

The module **sysglobals** contains system global variables that are available to all programs running under the operating system. Among these variables are procedure variables, which are declared as follows:

```
type
  procvar = procedure(i : integer);

var
  p : procvar;
```

Implicit in this declaration is the type of the procedure variable. Type as it applies to procedure variables is really a description of the procedure's parameters. In the simple example above, only one integer parameter was indicated in the declaration of the procedure variable. Procedure variables can be used to execute a procedure using the standard procedure **CALL**, which will execute the procedure passed to it and return to the local program. This procedure can be part of any loaded library or part of the operating system itself.

The **CALL** procedure, procedure variables and system global variables are the keys to tapping the power of interrupt service routines. Among the system globals are procedure variables for various interrupt service routines. A variable called **kbdisrhook** of type **kbdhook-**

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CIRCLE 243 ON READER CARD

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type corresponds to the keyboard interrupt service. A second procedure variable of type **kbdhooktype** called **rgphook** corresponds to the cursor knob found on some 9000 series keyboards.

Together these two procedures are responsible for the low-level processing of keyboard events. Each time a key is pressed (or the knob is rotated) a hardware interrupt is generated. One of these two procedures is called to deal with the interrupt.

These two procedures variables can be thought of as hooks into the operating system (as the procedure variable names imply) because they can be replaced or chained together with other interrupt service routines. This latter technique is used in MS-DOS hardware to create TSR (Terminate and Stay Resident) software like *Sidekick* (a pop-up utility) or *Superkey* (a keyboard macro program). However, in MS-DOS, this technique is much more difficult to im-

Program 1.

```
$sysprog on$                    {enable system programming features}
$UCSD$                          {enable UCSD extensions}
$search 'V11:INTERFACE.'$       {search INTERFACE for references}

program keytest(keyboard,output);

{keytest reports the statbyte and databyte each time}
{each time a key is pressed                         }
{Cntrl-C terminates the program                     }

import  sysglobals, sysdevs;  {import necessary modules}

var
  ch          :char;
  keyboard    :text;
  savekbdhook :kbdhooktype;   {saves the default keyboard isr}

procedure newhook(var statbyte, databyte:byte; var doit: boolean);

{newhook displays the statbyte}
{and databyte before passing  }
{them on to the default kbdisr}

begin
  if doit then
    begin
       writeln('Databyte: ',databyte:3, 'Statbyte: ', statbyte:3);
       call(savekbdhook, statbyte, databyte, doit);
    end;
 end;     {of newhook procedure}

begin     {start of main}
  savekbdhook:=kbdisrhook;    {save old kbdisr}
  kbdisrhook:=newhook;        {replace with new routine}
  repeat                      {loop until ^C}
    if not unitbusy(2) then   {has a key been pressed}
      read(keyboard,ch);      {read it}
  until ch = #3;              {if ^C terminate loop}
  ch:=#0;                     {purge exit character if P-load}
  kbdisrhook:=savekbdhook;    {Restore normal kybd processing}
  writeln('Cntrl/C....exit'); {signal end of program}
end.
```

plement and by no means bomb proof.

Replacing an interrupt service routine in HP PASCAL involves writing a replacement routine and assigning it to the appropriate variable. Given the following declaration:

```
var
  newhook : kbdhooktype;
```

the replacement of the keyboard ISR is accomplished with this single assignment statement:

```
kbdisrhook := newhook;
```

The global variable **kbdisrhook**, which once pointed to the original ISR, now points to our replacement ISR.

Why would you want to meddle with these system details? Sometimes the system services do not provide all that is required. At times, a lower level approach is needed. For example, the function keys and the specially labeled keys found on the 9000 series keyboards do not generate ASCII codes when read with the standard input functions.

Obviously, every key must, on some level, generate a unique response to being pressed, otherwise it could not be differentiated. On the level of the keyboard ISR, each generates a unique databyte (except for status keys like SHIFT and CNTRL). Even the number 7 on the numeric keypad, for example, generates a different databyte from the number 7 on the standard keyboard.

The second variable used by the keyboard ISR is the statbyte. It indicates the condition of the SHIFT, CNTRL and EXTEND CHAR keys. The system looks at the status of the SHIFT key and delivers either an ASCII 65 or 97 when the A key is pressed. If the CNTRL key is pressed, the ASCII value is 1. But what about CNTRL-Keypad 5? The information is contained in the databyte and statbyte, but is not available through the standard system services.

However, extended keyboard functionality is easily obtained by intercepting the statbyte and databyte before passing them on to the operating system. This is accomplished by placing another procedure in the chain of execution of the interrupt service. The current ISR must be replaced by making an assignment to the **kbdisrhook** variable, but rather than totally replace the original procedure, it is far easier to process the statbyte and databyte as necessary and then call the original routine.

Program 1 is a trivial (although useful and instructive) program that intercepts and reports the value of the statbyte and databyte. (It originally was written to test the documented key codes that proved to be in error.)

Keytest begins with an assignment to **savekbdhook**, which effectively

saves the current ISR for restoration at the end of the program. Then it assigns the new ISR procedure variable to the **kbdisrhook** so that it will be called to process keyboard input. The program loops through a keyboard read loop until CNTRL-C is pressed. In so doing, it calls the keyboard interrupt service routine repeatedly. All of the useful work (i.e., displaying the values) is done from within the ISR itself. The Boolean variable **doit** is set true if a non-status key has been pressed (i.e., any key but CNTRL, SHIFT, EXTEND CHAR). Finally, the **CALL** procedure is used to pass control to the original ISR, completing the chain.

The powerful system extensions to the PASCAL language and the design of the system itself have made this relatively detailed system programming simple and safe.

One common reason for chaining into the keyboard ISR is to get extended keyboard combinations using the SHIFT, CNTRL and EXTEND CHAR keys in combination with the function or keypad keys. This can be done by isolating bits in the statbyte and setting flags that can be processed by your application. For example, this code fragment tests for the control key status:

```
var
  control : boolean;

  if odd(statbyte div 32) then
    control := false
  else
    control := true;
```

Flags for the other status keys can be set in a similar fashion. Combinations of the three status keys can be used when many key combinations are required or when a key combination is purposefully made difficult to prevent accidental invocation of a dangerous command.

Notice that in *Program 1* the final program statement restores the original ISR. Care should be taken when manipulating ISRs since abnormal program termination before restoration of the original ISR will require that the computer be rebooted. Fortunately, the operating system has a facility for error trapping called the TRY-RECOVER statement. When the TRY is executed, it saves information about the state of the program by pushing it on the stack. When an error is encountered, the statement following RECOVER is executed. The general form of the TRY-RECOVER is:

```
TRY
  <statement>
  .
  .
  .
  <statement>
RECOVER
  <statement> {restore ISRs here}
```

CHAINING TO THE ISR is a convenient and powerful tool for gaining more direct and detailed control of the hardware. The powerful system extensions to the PASCAL language and the design of the system itself have made this relatively detailed system programming simple and safe. All systems programmers should be so lucky. —*Bob Youngquist is president of Insight Instrument, Fort Erie, Ontario.*

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CIRCLE 102 ON READER CARD

BOOKS

Peggy King

Two Guides In One

BEYOND RISC!

Earlier this year, *BEYOND RISC!* was published by Software Research Northwest, Inc. (Vashon Island, WA). As I read it I thought about how handy this guide would have been if it had been available last fall when I was writing a script for a slide presentation about Hewlett-Packard Precision Architecture (HP-PA).

The best features of this guide are its HP history lesson, its explanation of how Precision Architecture evolved, and its comparisons between the Series 930 and 950 RISC computers and the Complex Instruction Set HP 3000 computers.

The problems arise when useful, general information is mingled in the same chapter with very specific technical information of interest mainly to systems programmers who need to deal with the intricacies of the operating system. Some chapters take gigantic leaps from general interest information to system programmer specifics. For example, Chapter 6 begins with a definition of the term computer architecture, tells how HP-PA was developed at HP labs and ends up discussing how to write I/O drivers.

The six authors and one editor should have written two separate books instead of combining general and technical information as they do in many of the chapters.

If read selectively, *BEYOND RISC!* can be an excellent introduction to users who have a new Series 930 or 950 at their workplace. For the benefit of new users of Precision Architecture computers who are managers, MIS directors, training specialists or in other positions requiring a knowledge of the machine, I will recommend chapters and portions of chapters to read for general information about the new machine that has just arrived or is soon to be shipped to your computer room at work.

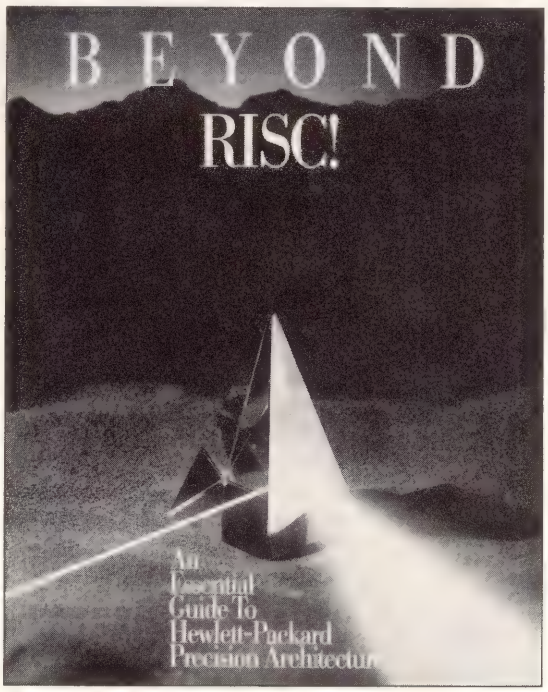
Even if you have been an HP customer for many years, you may learn some new HP trivia in Chapter 1, "A Brief History of Hewlett-Packard." (I learned, for instance, how the Neely Sales Region got its name.) Chapter 2 covers the HP 3000 prior to the introduction of HP-PA machines.

For those of you interested in knowing some of the technical foundations of Precision Architecture, the third chapter explains microcode and the history of reduced instruction set computing more clearly than the literature HP has published on RISC vs. CISC. Just as RISC is simpler than CISC architecture, so is the fifth chapter on HP-PA more simple than the fourth chapter on HP 3000 architecture.

Those of you lacking a degree in computer science can glean useful information about computer architecture and the theory behind reduced instruction sets in Chapter 5, but stop when you get to the "Technical Aspects of HP-PA" section.

Skip Chapter 6, "General Software Aspects," except for the "Short Course in Compilers" section, which uses clear and simple language to explain how compilers work. Skip to page 85 and read the first two paragraphs of the "Compiler Structure" section if you want to learn the differences between the front end and the back end of a compiler.

Chapter 7, which I would have placed just after the chapter describing



BEYOND RISC!
An Essential Guide To Hewlett-Packard Precision Architecture

Editor: Wayne E. Holt
Authors: Steven M. Cooper, Jason M. Goertz, Scott E. Levine, Joanna L. Mosher, Stanley R. Seiler Jr., Jacques Van Damme

Software Research Northwest Inc.
Route 1, Box 610
Vashon Island, WA 98070
(206) 935-3100
CIRCLE 300 ON READER CARD

the HP 3000 family, describes features of the HP 3000 Series 900 family as succinctly and more readably than most datasheets. This part is recommended even for novices since all acronyms are written out the first time and technical concepts are explained in clear prose.

Leave Chapters 9 through 11 for the operating system tinkerers, but those of you unfamiliar with the file types found in MPE can glance at Chapter 12 for definitions of different types of files found in MPE/XL.

Chapter 13 gives general information about databases and a history of HP's very popular IMAGE product. The information on ALLBASE on page 166 now is obsolete due to a strategy change at HP's Business Systems Sector. (See the article on ALLBASE in the News & Trends section of the June 1988 issue.)

In Chapter 17 you'll find summaries of the languages supported by HP for the HP 3000 Series 900s. The general information turns technical when you get to "Interlanguage Calls" on page 219.

After this section, the only reading material left for non-techies is the comprehensive glossary that consists mainly of technical terms. Most of these definitions are clear, concise and valuable as reference information.

Systems programmers interested in the bits and bytes of HP-PA should read any parts of *BEYOND RISC!* not mentioned so far. For your reference, the appendices contain a list of the entire HP-PA instruction set and a guide to MPE/XL Debug.

Just after the glossary are pictures and bios about all of the authors and the editor. I would have replaced the "Chronological Author's Bibliography," which lists every article any of the seven has written in the past 10 years, with an afterword (or a forward) that tells which author wrote which section. The quality of the writing and level of explanations are so widely varied that it is clear that different authors were responsible for single chapters.

Instead of working as a gang of seven, these authors would have done better to divide and conquer. One team could have worked on a guide to new customers aimed at non-technical users, especially those who are accustomed to computers from other vendors. This guide could be used in training sessions to be held while you wait for your Series 900 computer to be delivered. The other authors could have written a guide for systems programmers who can't wait to begin exploring the operating system as soon as the new machine gets plugged in. *—Peggy King is an independent consultant and free-lance writer based in San Jose, California.*

Continued from page 24.
objects and relationships that make up the knowledge base.

NEXPERT OBJECT provides program libraries that allow it to be easily embedded within other programs written in standard computing languages such as FORTRAN, C, ADA, PASCAL and COBOL.

NEXPERT OBJECT supports the X Window System, MIT's standard windowing interface, on the HP 9000. Applications developed using NEXPERT also will run under character-based terminals, HP NewWave and any other presentation manager available.

Contact Neuron Data, 444 High St., Palo Alto, CA 94301; (415) 321-4488.

Circle 393 on reader card

POS System Integrated With HP 3000 Software

Info-Point Corporation, an Authorized MCBA Installer, recently announced a microcomputer-based point-of-sale (POS) system that integrates with MCBA's accounting and distribution software for the HP 3000 Series.

The Info-Point system is designed for small retail chains that manage financial and inventory data from a central computer.

The POS system ($1,200 — $2,400) runs on any IBM PC/XT/AT or compatible, each controlling up to eight cash drawers in each store, linked by modem to any HP 3000.

PCs in each store operate independently, storing customer transactions until the data is uploaded to a central HP 3000, usually overnight. The data automatically interfaces with MCBA's Accounts Receivable, Customer Order Processing and Inventory Management packages, allowing the user to accurately track sales and inventory status at each store.

Contact MCBA, 425 W. Broadway, Glendale, CA 91204-1269; (818) 242-9600.

Circle 390 on reader card

RGB Enhances Scan Converter Line

RGB Technology has enhanced its RGB/Videolink line of scan converters with an anti-flicker filter.

The addition of the proprietary filter effectively eliminates the problem of flicker in an interlaced display format, which includes all television standards. The anti-flicker filter makes possible a composite television image similar to the original computer image in stability.

The RGB/Videolink converts high-resolution computer graphics to television (NTSC) video for videotaping, video projection or video transmission. It's the first high-resolution scan converter to offer line averaging, full color and real-time performance. An advanced architecture makes possible lower prices than previous generations of scan converters.

The RGB Videolink accepts full-screen, non-interlaced RGB input, provides genlock, sync generation and encoding to output NTSC video. Complete scan conversion is accomplished in real-time. The RGB Videolink requires no software modifications and doesn't affect performance of the host system or its RGB monitor. It's a complete solution to making videotape from a high-resolution computer.

Models of the RGB/Videolink are available for systems from Hewlett-Packard, Sun, Apollo, Silicon Graphics, DEC, IBM, Masscomp, Tektronix and others.

Contact RGB Technology, 3684 Hastings Ct., Lafayette, CA 94549; (415) 284-4330.

Circle 391 on reader card

QMS Unveils QMS Lasergrafix 2200

QMS Inc. has introduced the latest member of its Lasergrafix printer family, the QMS Lasergrafix 2200. It is the first printer in its price class ($14,995) to offer users print speeds up to 22 pages per minute and 11- x 17-inch paper handling. It also features HP-GL emulation for CAD/CAE and IBM mainframe users.

The new printer also is the first laser printer with B-size paper handling to include an emulator for an HP pen plotter.

With the optional QMS 80-VE interface, the QMS Lasergrafix 2200 can connect to a Versatec parallel interface on a CAD workstation or other engineering host computer and emulate the Versatec V-80 electrostatic printer for CRT screen printing, A- or B-size plotting and other text and graphics printing.

Contact QMS Inc., One Magnum Pass, Mobile, AL 36618; (205) 633-4300.

Circle 381 on reader card

Versatec Announces HP-GL Emulation

Versatec has announced the availability of HP-GL emulation for the 8500 Series of low-cost electrostatic plotters.

The new capability (under $20,000) enables emulation of HP's 7585/7586 Series of pen plotters. Owners of HP 7585/7586 pen plotters simply can plug in a Versatec 8500 Series electrostatic plotter with the new HP-GL code and receive fast, consistent drawings. No additional hardware or software changes are required.

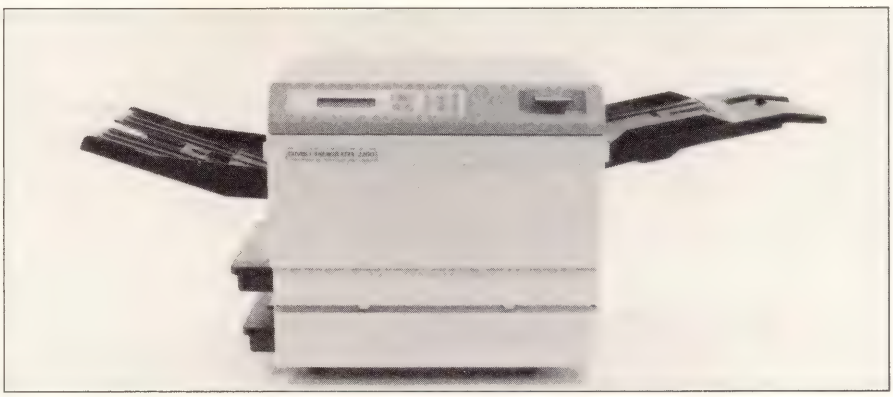
The new option allows the 8500 Series to accept HP-GL data via the RS-232C serial interface or via a Centronics-parallel interface. The software is loaded into the 8500 Series by diskette. No hardware changes or service-engineer installation is required.

Targeted at workstation and PC CAD users, the 8500 Series is both hardware- and software-compatible with 906/907 and HP-GL pen-plotter data formats. Popular application software packages such as AutoCAD, VersaCAD, DataCAD and Micro CADAM all support the 8500.

Two modules are available. The 8524 ($19,900) plots on 24-inch wide media and the 8536 ($24,900) on 36-inch wide media. Both plot with 200-ppi resolution at one inch per second. An E-size (34-inch by 44-inch) drawing can be plotted in less than 45 seconds.

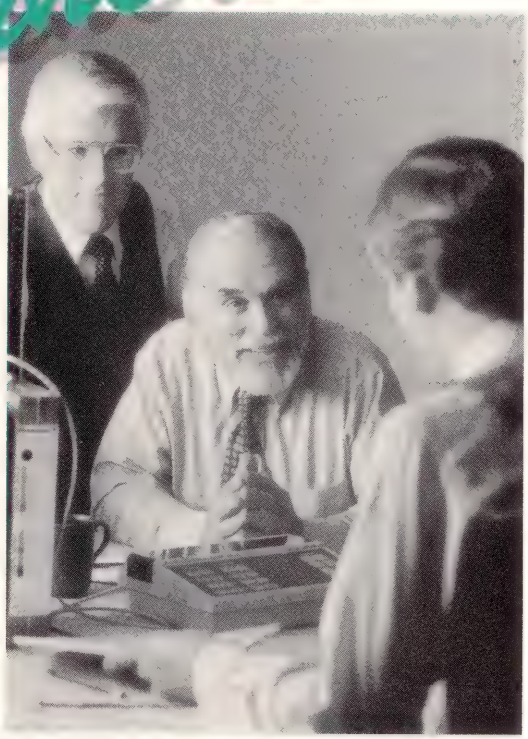
Contact Versatec, 2710 Walsh Ave., Santa Clara, CA 95051; (800) 538-6477, in California (800) 341-6060.

Circle 389 on reader card



The QMS Lasergrafix 2200.

Meet the technology leaders in OEM Peripherals



—at the Invitational Computer Conference near where you live and work.

Every group has its meeting place. In your area, the meeting place for the major manufacturers of OEM peripherals—and the decision-makers that specify and select these products—is the Invitational Computer Conference (ICC). This year there are 12 ICCs dedicated exclusively to the OEM peripheral market in the United States and Canada, and six in Europe. One will be convenient for you.

These one-day, seminar/displays are so popular because they give you just what you need to know without wasting your time or money. You don't travel, there's no admission fee, the seminars and table-top displays from major manufacturers are all targeted to your interests (no searching through aisles), and the atmosphere is informative and hands-on, but congenial, with refreshments served. In a few hours you'll have the latest story on the newest and best in disk and tape drives, controllers, terminals, printers, test equipment, etc.

Invitations to the ICC in your area are available from one of the many exhibitors or the ICC management. Request yours today.

1988/89
OEM Peripheral Series
U.S./Canada Locations

Newton, MA	Sept. 8, 1988
Herndon (Tysons Corner), VA	Sept. 20, 1988
Minneapolis, MN	Oct. 20, 1988
Westlake Village, CA	Oct. 25, 1988
Dallas, TX	Dec. 8, 1988
Irvine, CA	Jan. 5, 1989
Ft. Lauderdale, FL	Jan. 24, 1989
Seattle, WA	Feb. 21, 1989
San Jose, CA	Mar. 16, 1989
Raleigh, NC	Mar. 28, 1989
Toronto, Canada	Apr. 18, 1989
Nashua, NH	Apr. 24, 1989

European Locations

Frankfurt, W. Germany	Sept. 15, 1988
Stockholm, Sweden	Sept. 20, 1988
London, England	Sept. 27, 1988
Munich, W. Germany	Jan. 19, 1989
Milan, Italy	Jan. 26, 1989
Paris, France	Jan. 31, 1989

ICC Conference Management:
B. J. Johnson & Associates, Inc.
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Costa Mesa, California 92626
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FAX: 1-589 0893
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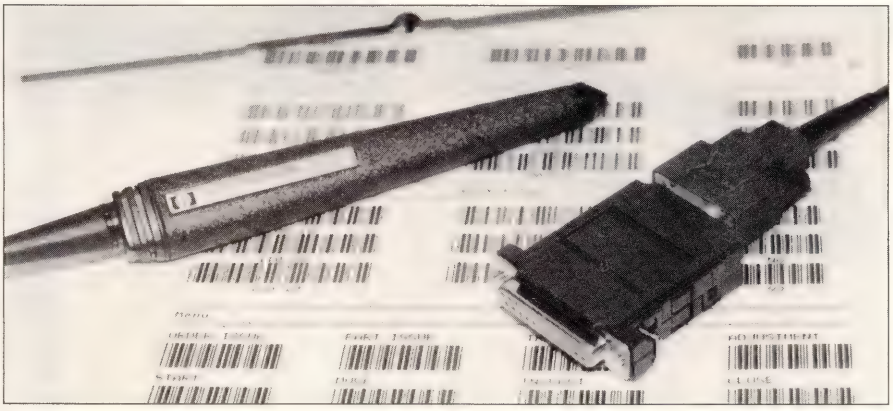

Minerva's Interface converts SmartWand output into RS-232C signal levels.

Minerva Releases HP SmartWand Interface

Minerva Consulting has extended the capabilities of the HP SmartWand family with the release of its HP SmartWand Interface.

The Interface converts the HP SmartWand 5 V serial output into the RS-232C signal levels required by most intelligent devices. The interface allows the SmartWand to be used directly with computers and terminals that have asynchronous RS-232C ports. It also allows the SmartWand to be used with intelligent peripherals such as scales, testers and controllers.

An optional feature provides audible and visual feedback to the user indicating the SmartWand has read and decoded the scanned code. All configurations and feature selections in the SmartWand are accessible through the interface. The SmartWand interface provides internally switchable DTE/DCE selections. It allows applications developers and systems personnel to control the SmartWand programmatically.

The interface allows users to integrate automatic data collection into existing systems. Old applications now can take advantage of bar code technology without time-consuming development. It can be used by VARs, OEMs and end users to solve a variety of data collection problems.

Contact Minerva Consulting, P.O. Box 670807, Marietta, GA 30066; (404) 565-4528.

Circle 388 on reader card

Off-Site Provides Resource Alternatives

Off-Site Inc. is available as an Alternate Resource Facility for HP 3000 users, providing Information Processing Audits, Disaster Recovery Hotsite Agreements and Lease Time.

The Information Processing Audit, developed by Off-Site Inc. is the computerized organization of critical data for all aspects of the data processing function. This software system takes data and presents it in the form of information. The auditing programs have been given instructions and standards that are used to analyze and rate the overall computer and software dependencies.

The end product serves as a management planning tool in order to ensure that the emergency procedures used in disaster recovery will allow continued operation of critical function.

Contact Off-Site Inc., 32 Ellicott St., Batavia, NY 14020; (716) 343-9775 or (716) 297-8719.

Circle 387 on reader card

KLA/Express Adds Job Scheduler/Controller

KLA & Associates has released the first module for its newly designed Version 5.00 of KLA/Express. A Job Scheduler/Controller is now an integral part of the KLA/Express software allowing users to define job limits based on job names, users and accounts. Wildcards also may be used in any of the specifications.

You now will be able to specify how many jobs from a specific account can be executing simultaneously along with mixing and matching with other jobs and accounts. Multiple batch queues can be established with their own limits and priority ranges.

This module is now available on Versions 5.00.Bnn and later and is designed to work under both MPE/V and MPE/XL. The module also may be purchased separately as a standalone package. Additional plug-in modules for controlling the environment

more efficiently will be released soon. Contact KLA & Associates Inc., P.O. Box 14854, Clearwater, FL 34629-4845; (813) 784-5976.

Circle 386 on reader card

Aldus Ships PageMaker 3.0 For PCs

Aldus Corporation has begun shipping PageMaker 3.0 for the PC, a major new version that includes support for long documents, enhanced graphics capabilities and user interface improvements, including built-in templates.

PageMaker integrates text and graphics and allows users to design, edit and produce high-quality printed communications in an office setting. Over 35 new features have been added to meet the needs of both business users and creative professionals.

Features such as autoflow and style sheets have extended the program's ability to address long documents without sacrificing ease of use.

With the release of PageMaker 3.0 ($795), Aldus is the only desktop publishing software vendor to offer image controls for scanned and bit-map images. The image control features work with both PostScript-language and non-PostScript-language printers.

PageMaker 3.0 expands its support for printers based on HP's Printer Command Language (PCL), including the LaserJet Plus and Series II printers.

Contact Aldus Corporation, 411 First Ave. S., Suite 200, Seattle, WA 98104; (206) 628-2352.

Circle 385 on reader card

Series 80 BASIC Programs Now Run On PCs

With Oswego Software's newest translator, Series 80 BASIC programs will run on PCs. The translator will run on Vectras and IBM PC and PS/2 compatibles in DOS 2.0 or later. Resulting programs will run in QuickBASIC 4.0.

A file copy utility that will move files written in Series 80 BASIC to the DOS computer will be included in the package. The software is available in both 3½-inch and 5¼-inch media.

The translator and file copy utility will provide over 95 percent translation for programs written on the HP 85, 86, 87 or 9915. Contact Edith McDonald, president, Oswego Software Inc., 507 N. Adams St., Oswego, IL 60543; (312) 554-3567.

Circle 384 on reader card

Intermetrics Releases Tools For 64700 Emulator

The Software Products Division of Intermetrics Inc. has announced software development tools that work with all products in the new HP 64700 standalone emulator series. The Intermetrics software includes C cross compilers, cross assemblers, XDB source level cross debuggers and utilities specifically designed for programming embedded microprocessors.

The software is targeted to program 68000, 80186 and Z80 microprocessors. It will be available initially on the Vectra PC and other IBM XT/AT compatibles. Future planned hosts include the HP 9000 Series 300, Sun and Apollo workstations and the DEC VAX.

The XDB source level cross debugger is a productivity tool designed to work with HP emulators to test and debug microprocessor code. XDB allows you to control program execution through setting breakpoints, single-stepping by machine instruction or source line and through the XDB assertion mechanism that tests for specific conditions that you define.

A transparency mode allows fast access to the HP 64700's command structure and record and playback commands allow you to recreate a debugging session at another time.

Contact the Intermetrics Sales Force, (800) 356-3594 or (617) 661-0072.

Circle 382 on reader card

CCS Ports Software To Spectrum

Corporate Computer Systems (CCS) has announced the porting of its SCREEN and SCONS packages to the Spectrum 800 Series computer. Due to an installed base of over 400 customers, CCS is committed to releasing these products on the 800 and continuing support for current customers.

SCREEN provides an alternative to conventional input and output form design. A true WYSIWYG forms design package, SCREEN allows the programmer to design, debug and maintain forms without disrupting the programs that use them.

The SCONS (Source CONtrol System) package provides sophisticated control over the management of large software projects. Currently available on the RTE and MPE/V operating systems, SCONS organizes and maintains all revisions of any type of file while controlling user access and modifications.

Contact Corporate Computer Systems Inc., 33 W. Main St., Holmdel, NJ 07733; (201) 946-3800.

Circle 383 on reader card

New 300-MB Winchesters For HP 1000, 9000 Systems

IEM Inc. has introduced the model H5-HP300H 300-MB Winchester hard disc for HP computers. These 5¼-inch Winchesters use the CS-80 data transfer protocol and are compatible with a variety of HP machines including the HP 1000 and HP 9000 Series 200/300/500.

As an added feature, the unit can be purchased with a built-in 3½-inch flexible disc drive for one-sided double-density, two-sided double-density or high-density diskettes. High-density diskettes have a storage capacity of about 1.6 MB per disc.

Switches on the H5-HP300H can be used to set the sector size to 256, 512 or 1,024 bytes, to yield a formatted capacity of 271-307 MB. These drives offer a data transfer rate of 10-15 Mbits per second and a mean access time of 16.5 msec.

Contact IEM Inc., P.O. Box 8915, Fort Collins, CO 80525; (303) 223-6071 or (800) 321-4671.

Circle 380 on reader card ■

CORRECTIONS

In "Scientific Visualization" (June 1988), by Andy Barlow, the photos on p. 31 were provided by 3D Biomedical Imaging Inc., Shawnee Mission, Kansas. The credit was mistakenly omitted.

In "*Universal Access* And *MiniWord*" (June 1988), p. 50, column 2, the line "Esc &11L to a Esc &10L" should read:

Esc &11L to a Esc &l0L

CONSULTANTS

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With eight expansion slots and up to 620 megabytes of mass storage, the 80386 models' built-in expandability will handle your most demanding applications.

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Both desk-top and floor-mount models support 5.25″ and 3.5″ internal flexible drives, while the 80286 and 80386 machines will run OS/2.

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HP Vectra RS/16 and RS/20 Personal Computers
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- Choice of 16 or 20 MHz, Intel 80386-based microprocessors
- Up to 620 Mbytes hard disc storage supported—17 millisecond average seek time for 100 through 620 Mbytes
- Up to 16 Mbytes of 32-bit memory using interleaved page-mode DRAM
- 8 accessory slots for expansion, 330-watt peak power supply, and six half-height mass storage shelves
- Both 5.25 and 3.5 inch flexible disc drives supported internally
- Separate mouse/graphics tablet port included
- Intel 80387 and Weitek 1167 co-processor support

HP Vectra ES and ES/12 Personal Computers
Mid-level, 80286 based

- Choice of 8 or 12 MHz, Intel 80286-based microprocessors
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- 7 accessory slots for expansion
- 20 and 40 Mbyte hard disc models
- Both 5.25 and 3.5 inch flexible disc drives supported internally
- Separate mouse/graphics tablet port included

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PCs like this are the product of a philosophy that never stops asking "What if...?" to create a better computing tool for your business.

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HP Vectra CS Personal Computer
Entry-level, 8086 compatible

- 7.16 MHz, 8086-compatible microprocessor with zero wait states
- Up to 8 Mbytes of expanded memory, addressable via LIM 3.2 expanded memory specification
- 7 accessory slots for expansion
- 20 Mbyte hard disc model
- Both 5.25 and 3.5 inch flexible disc drives supported internally

HP Portable Vectra CS Personal Computer
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[CALENDAR]

[AUGUST]

18: Greater Houston Regional Users Group Inc. quarterly meeting, Hobby Hilton, 8:00 a.m. — 5:00 p.m. Contact Suzanne Spitzer, program chairman, (713) 977-3193.

20: Philadelphia Area Computer Society's Sixth Annual Ham & Chip Flea Market, La Salle University Parking Lot, 20th & Olney Ave., Philadelphia, PA 19141. 9:00 a.m. — 1:00 p.m. Featuring: Computer Software/Hardware, Ham Radio, Sound and General Electronic Equipment. Call (215) 951-1255.

[OCTOBER]

11: Greater Los Angeles Users Group seminar, "How To Get The Most Out Of PowerHouse," Dave Robinson of Powerspec International, 8:30 a.m. — 5:30 p.m., Beverly Hills Ramada Hotel, 1150 South Beverly Dr., Los Angeles (north of Pico across from Vesoft headquarters). The seminar emphasis will include QUICK procedures, performance problem areas using QUIZ/QTP, customizing QUICK applications with security and designing efficient PowerHouse applications. Registration fee $195. Send check payable to Vesoft, indicating the names, addresses and telephone numbers of those who will attend, to Vesoft Inc., 1135 S. Beverly Dr., Los Angeles, CA 90035; (213) 282-0420.

26-28: Federal Computer Conference, Washington Convention Center, Washington, DC. Call (301) 961-8990 for exhibitor information.

31-11/3: UNIX Expo, Jacob K. Javits Center, New York, NY. Call (212) 391-9111 for exhibitor information.

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